Carrier
United Technologies

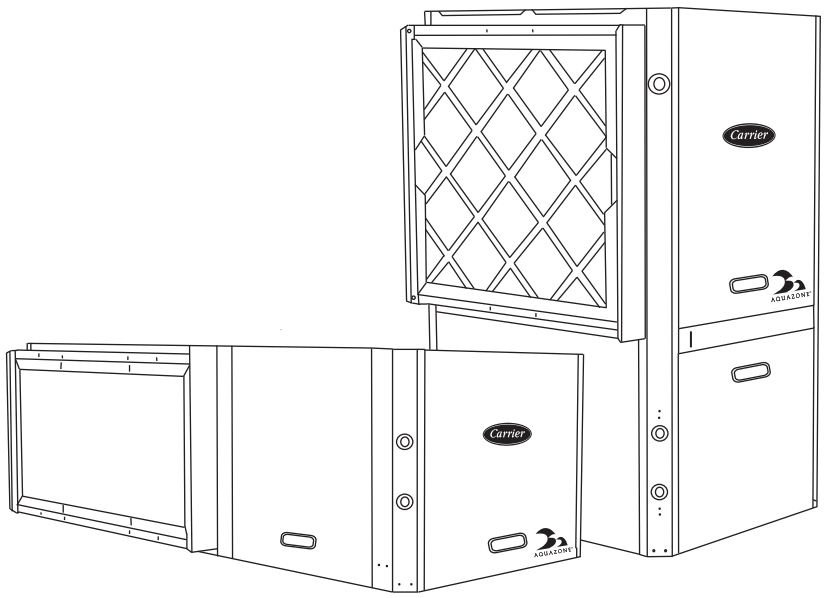
Advance Product Data*

Aquazone™ 50PTH, PTV024-070 Two-Stage Water Source Heat Pumps with Puron® Refrigerant (R-410A)

For units purchased on or after May 12, 2014.

2 to 6 Nominal Tons

AQUAZONE™



ASHRAE 90.1 COMPLIANT

Puron®

Single-package horizontally and vertically mounted water source heat pumps with electronic controls offer:

- Two-stage unloading scroll compressor
- Variable speed blower motor
- Exclusive double spring and grommet compressor isolation for ultra-quiet operation
- Available mute package for quieter operation
- Performance certified to ARI/ISO 13256-1
- Flexible and reliable multiple protocol WSHP Open controller can use BACnet*, Modbus†, N2, and LON (with a separate card) protocols for integrating energy efficiency and precise unit control (field-installed accessory)
- Hot gas reheat (HGR) available for dehumidification capability
- Optional tin-plated copper tubing and polymer coated aluminum fin evaporator coil available
- Non-ozone depleting Puron refrigerant (R-410A)

Features/Benefits

Carrier's Aquazone two-stage water source heat pump (WSHP) with Puron refrigerant (R-410A) is a high quality, ultra-efficient solution for all boiler/tower and geothermal design applications.

Operating efficiency

Carrier WSHPs are designed for quality and high performance over a lifetime of operation. Two-stage WSHP models with Puron refrigerant offer cooling EERs (Energy Efficiency Ra-

Features/Benefits (cont)

tios) to 37.0 and heating COPs (Coefficiency of Performance) to 6.5.

All efficiencies stated are in accordance with standard conditions under ISO (International Organization for Standardization) Standard 13256-1:1998 and provide among the highest ratings in the industry, exceeding ASHRAE (American Society of Heating, Refrigerant and Air-Conditioning Engineers) 90.1 Energy Standards.

High quality construction and testing

All units are manufactured to meet extensive quality control protocol from start to finish through an automated control system, which provides continuous monitoring of each unit and performs quality control checks as equipment progresses through the production process. Standard construction features of the Aquazone™ units include:

Cabinet — Standard unit fabrication consists of heavy gage galvanized sheet metal cabinet construction designed for part standardization (i.e., minimal number of parts) and modular design.

All interior surfaces are lined with $^1/_2$ in. thick, $1^1/_2$ lb per cubic ft density, foil faced Micromat insulation for thermal insulation and acoustical attenuation. This insulation is non-combustible, non-hydroscopic and does not support fungal growth. Insulation meets NFPA90A and 90B for fire protection and is certified to meet the Greenguard Indoor Air Quality Standard for Low Emitting Products.

Compressor — Two-stage models with Puron® refrigerant (R-410A) offer a dual level vibration isolation system. Noise reduction is a critical consideration of the unit design. All units have a unique floating base. The compressor is mounted on a heavy steel plate which rests on a high density rubber pad on the base of the unit. In addition, compressors are mounted on rubber grommets. This double isolation is standard in all units preventing vibration and noise transmission from the compressor to the unit structure resulting in exceptionally quiet operation. The compressor has thermal overload protection and is located in an insulated compartment away from the airstream to minimize sound transmission.

Blower and motor assembly — Large blower wheels allow the unit to operate at lower speeds for quieter operation.

The constant-torque blower motor can handle up to 1 in. w.g. external static pressure making it a wise choice for high filtration applications. The 460-v constant torque motors do not require a neutral wire.

Multiple speed ECM (electronically commutated motor) motors are optional on units, allowing the user to select the correct speed to deliver the specified airflow and the design system static pressure.

Motors are mounted on the fan housing with rubber grommets to prevent noise and vibration transmission to the unit and airstream.

A 1-in. supply air duct-flange connection is standard, facilitating duct installation on the unit. Horizontal units are field convertible from straight through to an end discharge arrangement.

Refrigeration/water circuit — All units contain sealed Puron® refrigerant (R-410A) circuits including a high-efficiency Copeland UltraTech™ two-stage compressor designed for heat pump operation, a thermostatic expansion valve for refrigerant metering, an enhanced corrugated aluminum-lanced fin and rifled copper tube refrigerant-to-air heat exchanger, reversing valve, coaxial (tube-in-tube) refrigerant-to-water heat exchanger, and safety controls including a high-pressure switch, low-pressure switch, water coil low temperature sensor, and air coil low temperature sensor.

ARI/ISO — Aquazone units have ARI (Air-Conditioning & Refrigeration Institute)/ISO, NRTL (Nationally Recognized Testing Lab), or ETL labels and are factory tested under normal operating conditions at nominal water flow rates. Quality assurance is provided via testing report cards shipped with each unit to indicate specific unit performance under cooling and heating modes of operation.

Quiet operation

Fan motor insulation and double isolated compressor are provided for sound isolation, cabinets are fully insulated to reduce noise transmission, low speed blowers are utilized for quiet operation through reduced outlet air velocities, and air-to-refrigerant coils are designed for lower airflow coil face velocities.

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Puron® refrigerant (R410-A)

Puron refrigerant (R-410A) is a non-chlorine based enviromentally balanced, non-ozone depleting refrigerant. Puron refrigerant characteristics, compared to R-22, have:

- Binary and near azeotropic mixture of 50% R-32 and 50% R-125.
- Higher efficiencies (50 to 60% higher operating pressures).
- Virtually no glide. Unlike other alternative refrigerants, the two components in Puron refrigerant have virtually the same leak rates. Therefore, refrigerant can be added if necessary without recovering the charge.

Optional evaporator coil protection

All units come standard with a copper coil aluminum fin evaporator coil. These evaporator coils employ lanced fin and rifled tubing for maximum heat transfer. Large face areas result in lower face velocity reducing sound while ensuring high latent heat removal for maximum dehumidification in the cooling mode.

Optional tin electro-plated copper tubing with high-tech polymer coated aluminum fins protect the evaporator coil from all forms of corrosive elements in the airstream. Corrosion often results in refrigerant leaks and eventual failure of the air coil costing hundreds of dollars to replace. Studies have also shown that these air coil coatings improve moisture shedding and therefore improve a unit's moisture removal capability resulting in a more comfortable indoor environment. The 50PTH, PTV units assure both maximum air coil life and comfort.

Design flexibility

Airflow configurations for horizontal units are available in four patterns including left or right return, and left, right, or back discharge. Horizontal and downflow units are field convertible from left or right discharge to back discharge. Vertical units are available in three airflow patterns including top discharge with right or left return. Standard entering water temperature is between 50 and 100 F. Extended entering water temperature range between 25 F and 110 F offers maximum design flexibility for all applications. Water flow rates as low as 1.5 gpm per ton assist with selection from a range of various circulating pumps. Factory-installed options are offered to meet specific design requirements.

Safe, reliable operation

Standard safety features for the refrigerant circuit include high-pressure switch, low-pressure sensor to detect loss of refrigerant, and low air temperature sensor to safeguard against freezing. Equipment safety features include water loop temperature monitoring, voltage protection, water coil freeze protection, and standard electronic condensate overflow shutdown. All safety features are tested and run at the factory to assure proper operation of all components and safety switches.

All components are carefully designed and selected for endurance, durability, and carefree day-to-day operation.

The Aquazone™ unit is shipped to provide internal and external equipment protection. Shipping supports are placed under the blower housing and compressor feet. In addition, horizontal and vertical units are both mounted on oversized pallets with lag bolts for sturdiness and maximum protection during transit.

Ease of installation

The Aquazone unit is packaged for simple low cost handling, with minimal time required for installation. All units are pre-wired and factory charged with refrigerant. Horizontal units are provided with factory-installed hanger isolation brackets. Vertical units are provided with an internally trapped condensate drain to reduce labor associated with installing an external trap for each unit. Water connections ($^3/_4$ in. diameter FPT) and condensate drains (FPT) are anchored securely to the unit cabinet.

Simple maintenance and serviceability

The Aquazone water source heat pump (WSHP) units are constructed to provide ease of maintenance. Units allow access to the compressor section from 2 sides and have large removable panels for easy access. Additional panels are provided to access the blower and control box sections.

The blower housing assembly can be serviced without disconnecting ductwork from the dedicated blower access panel. Blower units are provided with permanently lubricated bearings for worry-free performance. Blower inlet rings allow removal of the blower wheel without having to remove the housing or ductwork connections.

Electrical disconnection of the blower motor and control box is easily accomplished from quick disconnects on each component.

Easy removal of the control box from the unit provides access to all refrigeration components.

The refrigeration circuit is easily tested and serviced through the use of high and low pressure ports integral to the refrigeration circuit.

Maximum control flexibility

Aquazone water source heat pumps provide reliable control operation using a standard microprocessor board with flexible alternatives for many direct digital controls (DDC) applications including the Carrier Comfort Network® (CCN) controls and open protocol systems.

The Aquazone™ standard unit solid-state control system, the Complete C, provides control of the unit compressor, reversing valve, fan, safety features, and troubleshooting fault indication features. The Complete C control system is a user friendly, low cost, advanced WSHP control board. Many features are field selectable to maximize flexibility in field installation. The overall features of this standard control system include:

75 va transformer — The transformer assists in accommodating accessory loads.

Anti-short cycle timer — Timer provides a minimum off time to prevent the unit from short cycling. The 5-minute timer energizes when the compressor is deenergized, resulting in a 5-minute delay before the unit can be restarted.

Random start relay — Random start relay provides a random delay in energizing each different WSHP unit. This option minimizes peak electrical demand during start-up from different operating modes or after building power outages.

High and low pressure refrigerant protection — This protection safeguards against unreliable unit operation and prevents refrigerant from leaking.

Condensate overflow sensor — The electronic sensor is mounted to the drain pan. When condensate pan liquid reaches an unacceptable level, unit is automatically deactivated and placed in a lockout condition. Thirty

Features/Benefits (cont)

continuous seconds of overflow is recognized as a fault by the sensor.

High and low voltage protection — Safety protection for excessive or low voltage conditions is included.

Automatic intelligent reset — Unit will automatically restart 5 minutes after shutdown if the fault has cleared. Should a fault occur 3 times sequentially, lockout will occur.

Accessory output — Twenty-four volt output is provided to cycle a motorized water valve or damper actuator with compressor in applications such as variable speed pumping arrangements.

Performance monitor (PM) — This feature monitors water temperatures to warn when the heat pump is operating inefficiently or beyond typical operating range. Field selectable switch initiates a warning code on the unit display.

Water coil freeze protection (selectable for water or antifreeze) — Field selectable switch for water and water/glycol solution systems initiates a fault when temperatures exceed the selected limit for 30 continuous seconds.

Air coil freeze protection (check filter operation) — Field selectable switch for assessing excessive filter pressure drop initiates a fault when temperatures exceed the selected limit for 30 continuous seconds.

Alarm relay setting — Selectable 24 v or pilot duty dry contact provides activation of a remote alarm.

Electric heat option — The output provided on the controller operates two stages of emergency electric heat.

Service Test mode with diagnostic LED (light-emitting diode) — The Test mode allows service personnel to check the operation of the WSHP and control system efficiently. Upon entering Test mode, time delays are sped up, and the Status LED will flash a code to indicate the last fault experienced for easy diagnosis. Based on the fault code flashed by the status LED, system diagnostics are assisted through the use of Carrier provided troubleshooting tables for easy reference to typical problems.

LED visual output — An LED panel indicates high pressure, low pressure, low voltage, high voltage, air/water freeze protection, condensate overflow, and control status.

Hot gas reheat — Hot gas reheat (HGR) allows the user to control not only space temperature, but also humidity levels within the conditioned space. Excessive moisture in the space can promote mold growth leading to damage in the structure or interior surfaces, as well as reducing the air quality and creating an unhealthy environment.

Excess humidity may be caused by the unit having to operate under a widely varying load, an oversized short cycling unit, a high percentage of unconditioned outside air being introduced into the space, a high latent load in the space and any location where humidity infiltration is a problem.

Typical unit control is by a wall mounted thermostat that senses temperature in the occupied space. By utilizing a humidistat in addition to the thermostat, we are able to monitor the humidity levels in the space as well. The HGR option allows cooling and dehumidification to satisfy both the thermostat and humidistat while preventing over-cooling of the space while in the dehumidification mode.

Once the thermostat reaches set point temperature and the humidity is above set point, the unit controller will energize the reheat valve to operate the unit in hot gas reheat mode, first cooling and dehumidifying, then reheating the air using hot refrigerant gas before delivering it to the space, usually 2 to 5 F below room temperature. The unit is operating as a dehumidifier. By reheating the air along a constant sensible heat line, the relative humidity of the leaving air is reduced.

The moisture removal capacity of a specific heat pump is determined by the unit latent capacity rating. A heat pump's latent capacity can be determined by reviewing the heat pump specification data sheets. Depending upon the entering water and air conditions, a total and sensible capacity can be interpolated from the data shets. Subtracting sensible capacity from total capacity by 1069 (btu/lb of water vapor at 80° dry bulb and 67° wet bulb) yields the amount of moisture removal in pounds per hour.

* Sponsored by ASHRAE (American Society of Heating, Refrigerating, and Air-Conditioning Engineers).
† Registered trademark of Schneider Electric.

Model number nomenclature

50PTH,PTV PREMIUM EFFICIENCY

→ **50PTV 026 J C C 3 0 1 3 0**

Aquazone™ Two-Stage Water Source Heat Pump with Puron® Refrigerant (R-410A)
50PTH – Horizontal Configuration
50PTV – Vertical Configuration

Unit Size – Nominal Tons
024 – 2
036 – 3
048 – 4
060 – 5
070 – 6

Airflow Configuration

Horizontal

Option	Return	Discharge	Blower Motor
B –	Right	End	Constant Torque
E –	Left	Right (Straight)	Constant Torque
N –	Right	Left (Straight)	ECM
P –	Right	End	ECM
S –	Left	End	Constant Torque
W –	Left	End	ECM
Y –	Left	Right (Straight)	ECM
Z –	Right	Left (Straight)	Constant Torque

Vertical

Option	Return	Discharge	Blower Motor
J –	Left	Top	ECM
K –	Right	Top	ECM
L –	Left	Top	Constant Torque
R –	Right	Top	Constant Torque

Control
C – Standard C Microprocessor Control Package
D – Standard D Microprocessor Control Package

Factory Installed Options

	Std Filter	MERV8 Filter	MERV13 Filter
None	**X**	**Y**	**Z**
5 Kw Electric Heat	**A**	**B**	**W**
10 Kw Electric Heat	**C**	**F**	**R**
15 Kw Electric Heat	**D**	**G**	**S**
20 Kw Electric Heat	**E**	**T**	**H**

Operating Range/Sound Option

	Extended Range	
	Std	Extra Quiet
Standard	**A**	**J**
1/2" Closed Cell Foam	**D**	**F**

Valve Option
A – 2-Way Solenoid
C – None
D – Internal Pump

Revision Code
A – Current Revision

Voltage
3 – 208/230-1-60
5 – 208/230-3-60
6 – 460-3-60
C – 208/230-1-60 with Disconnect
E – 208/230-3-60 with Disconnect
F – 460-3-60 with Disconnect

Refrigerant and Water Circuit Options

	Non-Coated Air Coil		Duo-Guard Air Coil	
	Cu	CUNi	Cu	CuNi
Standard	**C**	**N**	**A**	**J**
Hot Gas Reheat	**E**	**P**	**D**	**F**

LEGEND
ECM — Electronically Commutated Motor

ARI/ISO capacity ratings

50PTH, 50PTV FULL LOAD APPLICATIONS

UNIT SIZE	WATER LOOP HEAT PUMP				GROUND WATER HEAT PUMP				GROUND LOOP HEAT PUMP			
	COOLING 86 F		HEATING 68 F		COOLING 59 F		HEATING 50 F		COOLING 77 F		HEATING 32 F	
	CAPACITY Btuh	EER Btuh/W	CAPACITY Btuh	COP	CAPACITY Btuh	EER Btuh/W	CAPACITY Btuh	COP	CAPACITY Btuh	EER Btuh/W	CAPACITY Btuh	COP
024	25,500	17.4	29,200	5.6	29,000	26.5	23,500	4.9	26,600	19.9	18,000	4.1
036	39,000	19.0	42,800	5.6	43,300	28.0	35,900	5.1	40,800	22.3	28,400	4.3
048	49,200	16.6	56,100	5.3	55,300	25.3	46,300	4.7	51,300	19.3	36,900	4.0
060	63,800	17.0	73,300	5.2	70,200	24.4	60,300	4.6	65,100	18.9	48,000	3.9
070	71,600	16.3	84,000	5.1	78,700	23.1	70,000	4.5	73,700	18.5	55,300	3.8

LEGEND

ARI — Air-Conditioning and Refrigeration Institute
COP — Coefficient of Performance
EER — Energy Efficiency Ratio
ISO — International Organization for Standardization

NOTES:
1. A brine-to-air heat pump using a brine solution circulating through a subsurface piping loop functioning as a heat source/heat sink.
2. The heat exchange loop may be placed in horizontal trenches or vertical bores, or submerged in a body of surface water.
3. The temperature of the brine is related to the climatic conditions and may vary from 20 F to 120 F.
4. Certified in accordance with the ARI/ISO Standard 13256-1 Certification Program, with 15% antifreeze solution.
5. Table does not reflect fan or pump power connections for ARI/ISO conditions.

50PTH, 50PTV PART LOAD APPLICATIONS

UNIT SIZE	WATER LOOP HEAT PUMP				GROUND WATER HEAT PUMP				GROUND LOOP HEAT PUMP			
	COOLING 86 F		HEATING 68 F		COOLING 59 F		HEATING 50 F		COOLING 68 F		HEATING 41 F	
	CAPACITY Btuh	EER Btuh/W	CAPACITY Btuh	COP	CAPACITY Btuh	EER Btuh/W	CAPACITY Btuh	COP	CAPACITY Btuh	EER Btuh/W	CAPACITY Btuh	COP
024	18,500	18.9	21,200	6.5	21,700	33.6	16,700	5.1	21,000	28.1	14,400	4.4
036	29,000	22.2	31,000	6.5	32,600	37.0	25,200	5.2	31,900	32.0	22,400	4.7
048	36,700	18.9	40,900	6.2	42,000	33.8	33,700	5.2	39,900	27.8	29,800	4.5
060	47,500	18.7	53,600	5.8	53,300	31.2	44,300	4.8	51,600	26.5	39,800	4.4
070	55,200	17.8	64,900	5.7	60,800	28.5	52,900	4.8	60,300	25.4	46,900	4.3

LEGEND

ARI — Air-Conditioning and Refrigeration Institute
COP — Coefficient of Performance
EER — Energy Efficiency Ratio
ISO — International Organization for Standardization

NOTES:
1. A brine-to-air heat pump using a brine solution circulating through a subsurface piping loop functioning as a heat source/heat sink.
2. The heat exchange loop may be placed in horizontal trenches or vertical bores, or submerged in a body of surface water.
3. The temperature of the brine is related to the climatic conditions and may vary from 20 F to 120 F.
4. Certified in accordance with the ARI/ISO Standard 13256-1 Certification Program, with 15% antifreeze solution.
5. Table does not reflect fan or pump power connections for ARI/ISO conditions.

Physical data

PHYSICAL DATA — 50PTH, PTV 024-070 UNITS

UNIT 50PTH, PTV	024	036	048	060	070
→ **COMPRESSOR**	Scroll				
REFRIGERANT CHARGE VT (oz)	58	98	88	110	114
REFRIGERATION CHARGE HZ ONLY (oz)	64	85	77	100	114
MAXIMUM WATER WORKING PRESSURE (psig/kPa)	450/3,100	450/3,100	450/3,100	450/3,100	450/3,100
CONSTANT TORQUE - FAN MOTOR/BLOWER					
Fan Motor Type/Speeds	Constant Torque / 5 speed				
Fan Motor (Hp)	0.33	0.75	0.75	1.00	1.00
Blower Wheel Size (D x W) (in.)	10 x 8	11 x 9	11 x 9	11 x 11	11 x 11
ECM CONST AIRFLOW - FAN MOTOR/BLOWER					
Fan Motor Type/Speeds	ECM Constant Air Flow				
Fan Motor (Hp)	0.33	0.75	0.75	1.00	1.00
Blower Wheel Size (D x W) (in.)	10 x 8	11 x 9	11 x 9	11 x 11	11 x 11
WATER CONNECTION SIZE					
FPT	3/4	1	1	1	1
Coaxial Coil Volume (gal)	0.33	1.18	0.62	1.07	1.12
VERTICAL CABINET					
Air Coil					
Dimensions (H x W) (in.)	24 x 20	32 x 26	32 x 26	38 x 26	38 x 26
Nominal size Standard Filter - 2-in. MERV11 (L x H)	24 x 24 (1)	16 x 30 (2)	16 x 30 (2)	20 x 30 (2)	20 x 30 (2)
Weight (lb)					
Operating	250	360	340	410	440
Shipping	350	475	450	530	560
HORIZONTAL CABINET					
Air Coil					
Dimensions (H x W) (in.)	18 x 31.5	20 x 42	20 x 42	20 x 49	20 x 49
Nominal size Standard Filter - 2-in. MERV11 (L x H)	18 x 18 (2)	20 x 24 (2)	20 x 24 (2)	18 x 20 (3)	18 x 20 (3)
Weight (lb)					
Operating	260	375	355	430	460
Shipping	360	495	470	550	580

LEGEND

ECM — Electronically Commutated Motor
HZ — Horizontal
VT — Vertical

Options and accessories

Factory-installed options

Cupronickel heat exchangers are available for higher corrosion protection for applications such as open tower, geothermal, etc. Consult the water quality guidelines for proper application and selection of this option.

Sound attenuation package (mute package) is available for applications that require especially low noise levels. With this option, a double application of sound attenuating material is applied, access panels are double dampened with $^1/_2$-in. thick density fiberglass insulation, and a unique application of special dampening material is applied to the curved portion of the blower. The mute package in combination with standard unit noise reduction features, as mentioned previously provides sound levels and noise reduction to the highest degree.

Compressor blanket provides a $^1/_2$-in. thick, closed cell foam insulation to help aid indoor air quality (IAQ) and to further attenuate low frequency noise from the compressor compartment. The closed-cell foam insulation option is available in all unit sizes. For additional sound attenuation, an optional compressor blanket is available.

Extended range units insulate the coaxial coil to prevent condensation, and therefore potential dripping problems, in applications where the entering water temperature is below the normal operating range (less than 60 F). Units are capable of operating at a range of 25 to 110 F.

Water circuit options provide internally mounted 2.5 or 3.0 gpm per ton automatic flow regulating valves for easier installation.

Two-way motorized control valve can be provided for applications involving open type systems or variable speed pumping. This valve will slowly open and close in conjunction with the compressor operation to shut off or turn on water to the unit.

Hot gas reheat (HGR) allows the user to control not only space temperature, but also humidity levels within the conditioned space. Excessive moisture in the space can promote mold growth leading to damage in the structure or interior surfaces, as well as reducing the air quality and creating an unhealthy environment.

Typical unit control is by a wall-mounted thermostat that senses temperature in the occupied space. By utilizing a humidistat in addition to the thermostat, we are able to monitor the humidity levels in the space as well. The HGR option allows cooling and dehumidification to satisfy both the thermostat and humidistat while preventing over cooling of the space while in the dehumidification mode.

Electronically commutated motors (ECM) provide soft starting, maintain constant airflow over the motor static operating range, and provide airflow adjustment on the motor control board. The fan motor is isolated from the housing by rubber grommets, is permanently lubricated and has thermal overload protection.

Evaporator coil protection — Optional tin electroplated copper tubing with high-tech polymer coated aluminum fins will protect the evaporator coil from all forms of corrosive elements in the airstream.

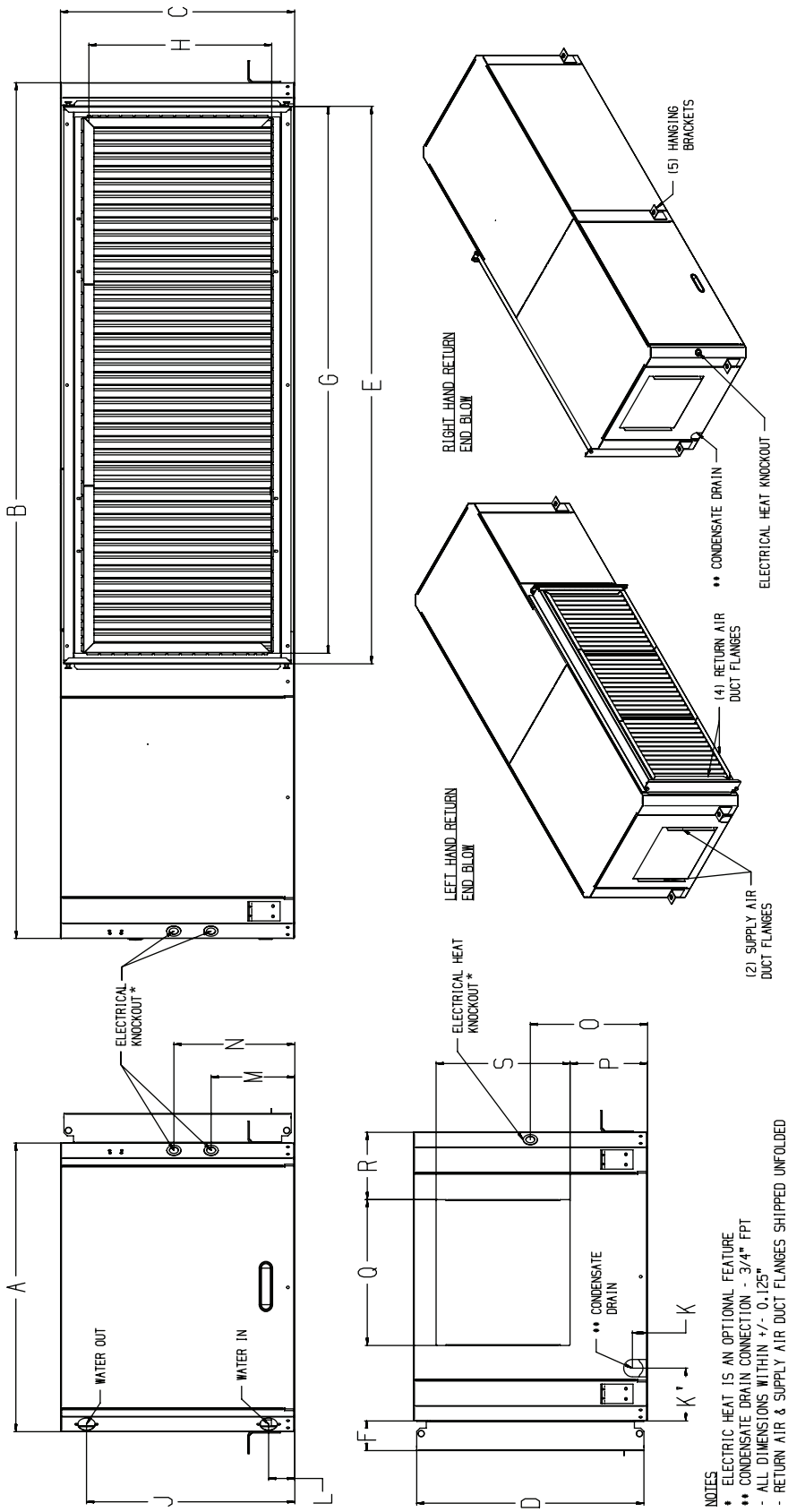
Field-installed accessories

WSHP Open multiple protocol controller is a proactive controller capable of communicating BACnet, Modbus, N2, and LON (with a separate card) protocols. The controller is designed to allow users access and ability to change and configure multiple settings and features including indoor air quality (IAQ), waterside economizer controls, etc.

Dimensions

50PTH024-070 UNITS SUPPLY AIR CONFIGURATION - END BLOW

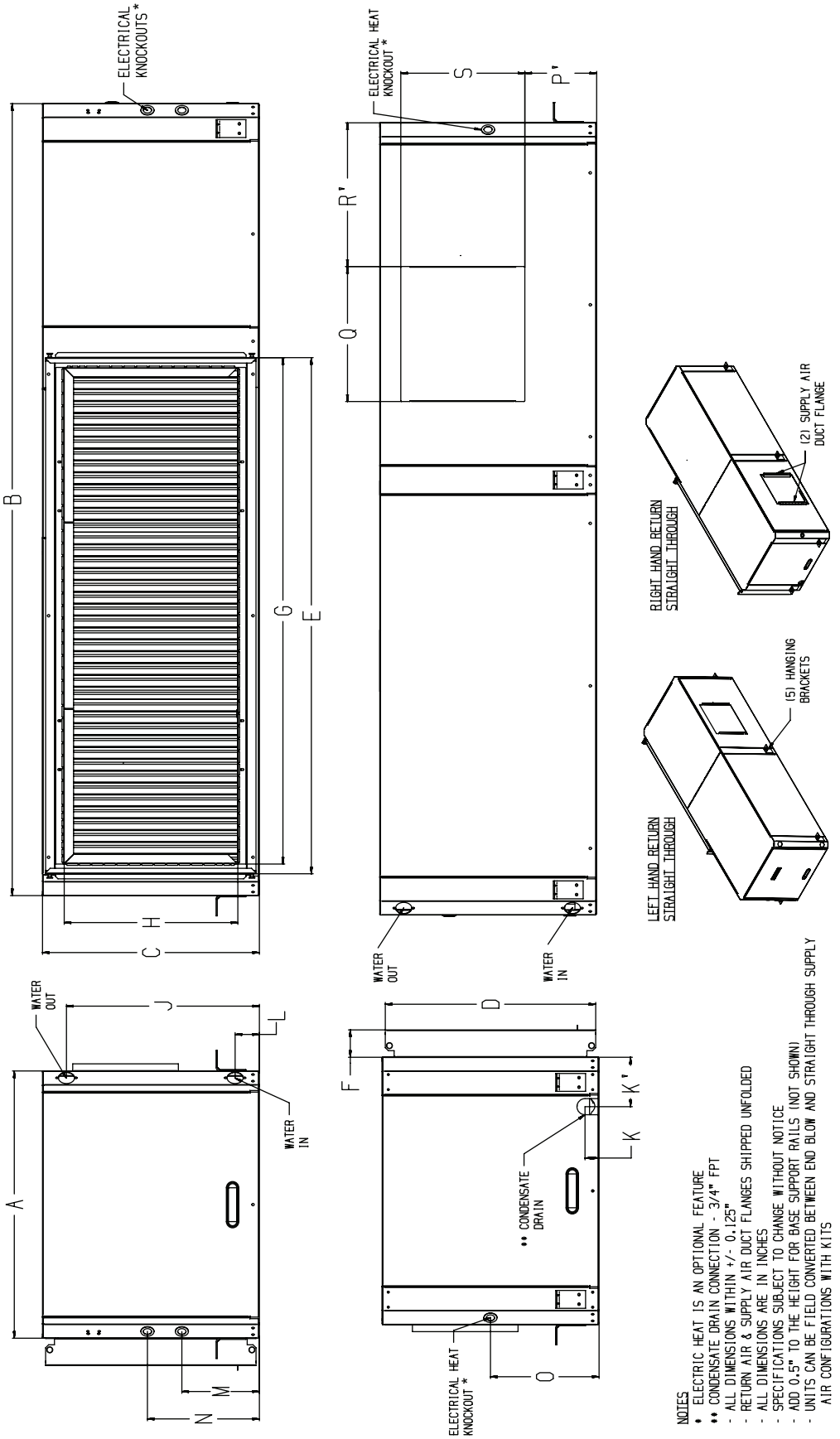
Model	A	B	C	D	E	F	G	H	J	K	K'	L	M	N	O	P(RH)	P'(LH)	Q	R(RH)	R'(LH)	S	WATER CONNECTIONS	FILTER SIZE
	WIDTH	DEPTH	HEIGHT	FILTER RACK HEIGHT	FILTER RACK WIDTH	FILTER RACK DEPTH	RETURN AIR DUCT WIDTH	RETURN AIR DUCT HEIGHT	WATER OUT	DRAIN PORT		WATER IN	ELECTRICAL KNCOCKOUT	ELECTRICAL KNOCKOUT	HEATER KNOCKOUT	SUPPLY AIR DUCT OPENING							
024	25.1	64.1	19.7	19.5	36.1	3.4	34.0	16.2	17.2	1.3	5.1	2.5	8.1	11.7	9.9	6.5	2.0	10.0	7.5	7.5	10.8	3/4" F.P.T.	18X18X1 (2)
036	28.0	76.0	22.7	22.1	48.1	3.4	46.0	18.2	20.2	1.3	5.1	2.5	8.1	11.7	11.4	7.5	2.0	11.7	9.0	7.7	13.0	1" F.P.T.	20X24X1 (2)
048	28.0	76.0	22.7	22.1	48.1	3.4	46.0	18.2	20.2	1.3	5.1	2.5	8.1	11.7	11.4	7.5	2.0	11.7	9.0	7.7	13.0	1" F.P.T.	20X24X1 (2)
060	28.0	83.0	22.7	22.1	54.1	3.4	52.0	18.3	20.2	1.3	5.1	2.5	8.1	11.7	11.4	7.5	2.0	14.2	6.5	6.5	13.0	1" F.P.T.	18X20X1 (3)
070	28.0	83.0	22.7	22.1	54.1	3.4	52.0	18.3	20.2	1.3	5.1	2.5	8.1	11.7	11.4	7.5	2.0	14.2	6.5	6.5	13.0	1" F.P.T.	18X20X1 (3)



Dimensions (cont)

50PTH024-070 UNITS SUPPLY AIR CONFIGURATION - STRAIGHT THROUGH

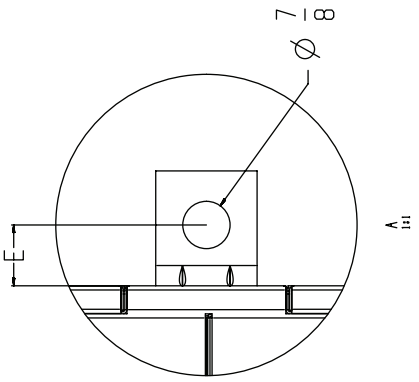
Model	A	B	C	D	E	F	G	H	J	K	K'	L	M	N	O	SUPPLY AIR DUCT OPENING					WATER CONNECTIONS	FILTER SIZE
	WIDTH	DEPTH	HEIGHT	FILTER RACK HEIGHT	FILTER RACK WIDTH	FILTER RACK DEPTH	RETURN AIR WIDTH	DUCT HEIGHT	WATER OUT	DRAIN PORT		WATER IN	ELECTRICAL KNCOCKOUT	ELECTRICAL KNOCKOUT	HEATER KNOCKOUT	P(RH)	P'(LH)	Q	R(RH)	R'(LH)	S	
024	25.1	64.1	19.7	19.5	36.1	3.4	34.0	16.2	17.2	1.3	5.1	2.5	8.1	11.7	9.9	2.0	6.5	10.0	11.8	11.8	10.8	3/4" F.P.T.	18X18X1 (2)
036	28.0	76.0	22.7	22.1	48.1	3.4	46.0	18.2	20.2	1.3	5.1	2.5	8.1	11.7	11.4	2.0	7.5	11.7	12.9	12.9	13.0	1" F.P.T.	20X24X1 (2)
048	28.0	76.0	22.7	22.1	48.1	3.4	46.0	18.2	20.2	1.3	5.1	2.5	8.1	11.7	11.4	2.0	7.5	11.7	12.9	12.9	13.0	1" F.P.T.	20X24X1 (2)
060	28.0	83.0	22.7	22.1	54.1	3.4	52.0	18.3	20.2	1.3	5.1	2.5	8.1	11.7	11.4	2.0	7.5	14.2	15.1	15.1	13.0	1" F.P.T.	18X20X1 (3)
070	28.0	83.0	22.7	22.1	54.1	3.4	52.0	18.3	20.2	1.3	5.1	2.5	8.1	11.7	11.4	2.0	7.5	14.2	15.1	15.1	13.0	1" F.P.T.	18X20X1 (3)



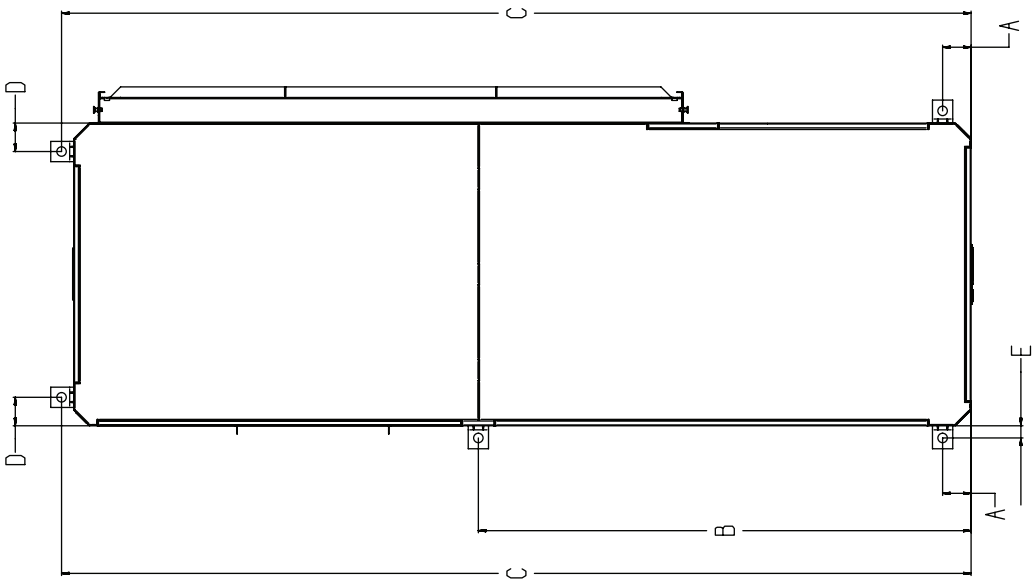
NOTES
* ELECTRIC HEAT IS AN OPTIONAL FEATURE
** CONDENSATE DRAIN CONNECTION - 3/4" FPT
- ALL DIMENSIONS WITHIN +/- 0.125"
- RETURN AIR & SUPPLY AIR DUCT FLANGES SHIPPED UNFOLDED
- ALL DIMENSIONS ARE IN INCHES
- SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE
- ADD 0.5" TO THE HEIGHT FOR BASE SUPPORT RAILS (NOT SHOWN)
- UNITS CAN BE FIELD CONVERTED BETWEEN END BLOW AND STRAIGHT THROUGH SUPPLY AIR CONFIGURATIONS WITH KITS

50PTH024-070 UNITS HANGING BRACKET SPECIFICATIONS

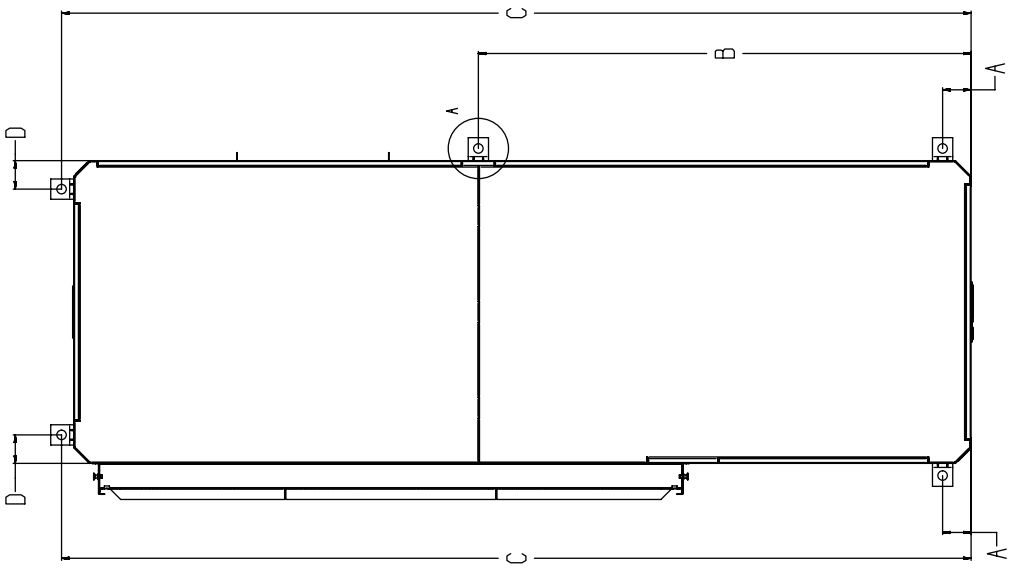
Model	A	B	C	D	E
LM024-HZ	2.634	32.817	65.225	2.634	1.125
LM036-HZ	2.634	33.972	77.125	2.634	1.125
LM048-HZ	2.634	33.972	77.125	2.634	1.125
LM060-HZ	2.634	45.573	84.125	2.634	1.125
LM070-HZ	2.634	45.573	84.125	2.634	1.125



NOTES
-ALL DIMENSIONS WITHIN +/- 0.125"
-ALL DIMENSIONS ARE IN INCHES
-SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE
-DIMENSION "E" IS TYPICAL FOR ALL MODELS, CONFIGURATIONS AND BRACKET POSITIONS



RIGHT HAND RETURN - TOP VIEW

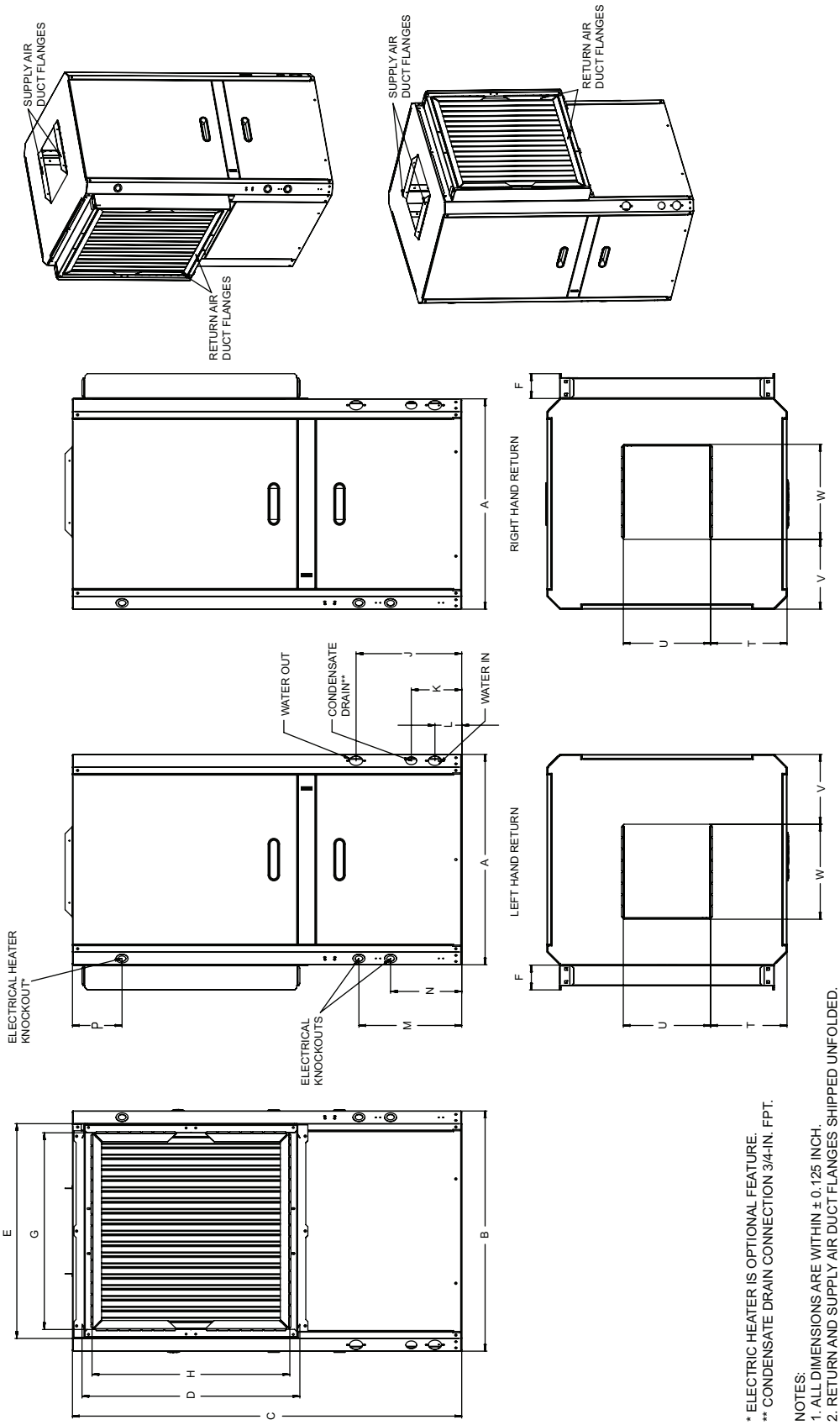


LEFT HAND RETURN - TOP VIEW

Dimensions (cont)

50PTV024-070 UNITS

Model	A	B	C	D	E	F	G	H	J	K	L	M	N	P	T		U		V		W		WATER CONNECTIONS	FILTER SIZE
	WIDTH	DEPTH	HEIGHT	FILTER RACK			RETURN AIR DUCT		WATER OUT	DRAIN PORT	WATER IN	ELECTRICAL KNOCKOUT		HEATER KNOCKOUT	SUPPLY AIR DUCT OPENING									
				HEIGHT	WIDTH	DEPTH	WIDTH	HEIGHT							LH	RH	LH	RH	LH	RH	LH	RH		
024	24.0	27.4	44.4	24.9	24.5	3.3	22.3	22.4	12.1	5.8	3.1	11.7	8.1	5.7	8.7	8.7	10	10	1.9	8	10.8	10.8	3/4" F.P.T	24X24X2 (1)
036	25.8	33.4	52.4	32.9	30.5	3.3	28.4	30.6	14.9	5.8	3.1	11.7	8.1	5.7	10.8	10.8	11.7	11.7	1.9	8.9	13	13	1" F.P.T	16X30X2 (2)
048	25.8	33.4	52.4	32.9	30.5	3.3	28.4	30.6	14.9	5.8	3.1	11.7	8.1	5.7	10.8	10.8	11.7	11.7	1.9	8.9	13	13	1" F.P.T	16X30X2 (2)
060	27.0	33.4	61.8	41.0	30.5	3.3	28.4	38.7	14.9	5.8	3.1	11.7	8.1	5.7	9.6	9.6	14.1	14.1	1.9	8.9	13	13	1" F.P.T	20X30X2 (2)
070	27.0	33.4	61.8	41.0	30.5	3.3	28.4	38.7	14.9	5.8	3.1	11.7	8.1	5.7	9.6	9.6	14.1	14.1	1.9	8.9	13	13	1" F.P.T	20X30X2 (2)



* ELECTRIC HEATER IS OPTIONAL FEATURE.
** CONDENSATE DRAIN CONNECTION 3/4-IN. FPT.

NOTES:
1. ALL DIMENSIONS ARE WITHIN ± 0.125 INCH.
2. RETURN AND SUPPLY AIR DUCT FLANGES SHIPPED UNFOLDED.
3. ALL DIMENSIONS ARE IN INCHES.
4. SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.

50PTH,PTV 024-070 CORNER WEIGHTS

UNIT SIZE	TOTAL (lbs)	LEFT HAND EVAPORATOR				RIGHT HAND EVAPORATOR			
		LEFT FRONT* (lbs)	RIGHT FRONT* (lbs)	LEFT BACK (lbs)	RIGHT BACK (lbs)	LEFT FRONT* (lbs)	RIGHT FRONT* (lbs)	LEFT BACK (lbs)	RIGHT BACK (lbs)
024	283	60	74	68	61	60	74	61	68
036	385	94	104	95	92	94	104	92	95
048	361	84	109	88	81	84	109	81	88
060	440	107	124	104	105	107	124	105	104
070	469	117	136	105	111	117	136	111	105

* Front is control box end.

LEGEND AND NOTES FOR PAGES 14-23

LEGEND

COP — Coefficient of Performance
EER — Energy Efficiency Ratio
EWT — Entering Water Temperature (F)
FOH — Feet of Heat
MBtuh — Btuh in Thousands

NOTES:
1. Interpolation is permissible; extrapolation is not.
2. AHRI/ISO certified conditions are 80.6 F db and 66.2 F wb in cooling and 68 F db in heating.
3. Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
4. Operation below 40 F EWT is based on a 15% antifreeze solution.
5. See Carrier WSHP Builder selection software for operating conditions other than those listed.

Performance data

50PTH,PTV024

650 CFM AT 0.34-in. ESP — PART LOAD

COOLING									HEATING						
Entering Fluid Temp (F)	Water Flow (GPM)	Pressure Drop PSI (FOH)	Entering Air Temp (db/wb) F	Total Capacity (MBtuh)	Sensible Capacity (MBtuh)	Heat of Rejection (MBtuh)	Power Input (kW)	EER	Entering Fluid Temp (F)	Pressure Drop PSI (FOH)	Entering Air Temp (F)	Total Capacity (MBtuh)	Heat of Absorption (MBtuh)	Power Input (kW)	COP
50	3	0.7 (1.7)	75/63	20.0	15.8	22.5	0.77	25.8	30	0.8 (1.8)	60	12.8	9.6	1.01	3.7
			75/63	20.0	15.8	22.5	0.77	25.8			70	12.4	8.9	1.13	3.2
			80/67	21.3	16.3	23.8	0.76	27.8			80	12.1	8.1	1.26	2.8
	4	1.3 (2.9)	85/71	22.7	16.8	25.1	0.76	30.0		1.3 (3.1)	60	13.1	10.0	1.01	3.8
			75/63	20.4	16.0	22.8	0.74	27.4			70	12.7	9.2	1.13	3.3
			80/67	21.8	16.5	24.1	0.73	29.7			80	12.3	8.4	1.27	2.9
	6	2.6 (5.9)	85/71	23.2	16.9	25.6	0.72	32.1		2.8 (6.4)	60	13.5	10.4	1.02	3.9
			75/63	20.8	16.2	23.1	0.71	29.1			70	13.1	9.5	1.14	3.4
			80/67	22.2	16.7	24.5	0.70	31.5			80	12.6	8.7	1.27	2.9
60	3	0.7 (1.6)	85/71	23.7	17.1	26.0	0.69	34.3	40	0.8 (1.8)	60	14.8	11.6	1.03	4.2
			75/63	19.0	15.4	21.7	0.86	22.1			70	14.3	10.7	1.15	3.7
			80/67	20.3	15.9	23.0	0.85	23.9			80	13.9	9.9	1.28	3.2
	4	1.2 (2.8)	85/71	21.6	16.3	24.3	0.84	25.7		1.3 (3.0)	60	15.2	12.0	1.03	4.3
			75/63	19.4	15.6	22.0	0.82	23.5			70	14.9	11.2	1.15	3.8
			80/67	20.7	16.0	23.3	0.81	25.4			80	14.3	10.3	1.28	3.3
	6	2.5 (5.7)	85/71	22.0	16.5	24.6	0.80	27.4		2.7 (6.1)	60	15.7	12.5	1.03	4.5
			75/63	19.8	15.7	22.3	0.79	25.0			70	15.4	11.6	1.15	3.9
			80/67	21.1	16.2	23.6	0.78	27.0			80	14.7	10.7	1.29	3.4
70	3	0.7 (1.6)	85/71	22.5	16.7	25.0	0.77	29.3	50	0.7 (1.7)	60	16.9	13.6	1.04	4.8
			75/63	18.0	15.0	21.0	0.96	18.7			70	16.4	12.7	1.16	4.2
			80/67	19.2	15.5	22.2	0.95	20.2			80	16.0	11.8	1.30	3.6
	4	1.2 (2.7)	85/71	20.4	16.0	23.4	0.94	21.6		1.2 (2.9)	60	17.4	14.2	1.04	4.9
			75/63	18.3	15.1	21.2	0.92	19.8			70	16.9	13.2	1.16	4.3
			80/67	19.6	15.6	22.5	0.91	21.5			80	16.5	12.3	1.30	3.7
	6	2.4 (5.5)	85/71	20.9	16.1	23.7	0.90	23.2		2.6 (5.9)	60	18.1	14.8	1.04	5.1
			75/63	18.7	15.3	21.5	0.89	21.1			70	17.4	13.7	1.16	4.4
			80/67	20.0	15.8	22.8	0.87	22.9			80	16.9	12.7	1.30	3.8
80	3	0.6 (1.5)	85/71	21.3	16.3	24.1	0.86	24.7	60	0.7 (1.6)	60	19.0	15.8	1.04	5.4
			75/63	17.0	14.5	20.2	1.08	15.8			70	18.5	14.8	1.17	4.7
			80/67	18.1	15.1	21.4	1.07	16.9			80	18.0	13.8	1.31	4.0
	4	1.1 (2.6)	85/71	19.3	15.5	22.6	1.06	18.2		1.2 (2.8)	60	19.7	16.4	1.04	5.6
			75/63	17.3	14.6	20.5	1.04	16.7			70	19.1	15.4	1.17	4.8
			80/67	18.5	15.2	21.6	1.03	18.0			80	18.6	14.4	1.31	4.2
	6	2.3 (5.4)	85/71	19.7	15.7	22.9	1.02	19.4		2.5 (5.7)	60	20.4	17.1	1.04	5.8
			75/63	17.6	14.8	20.7	1.00	17.6			70	19.7	16.0	1.17	4.9
			80/67	18.9	15.3	21.9	0.99	19.1			80	19.1	14.9	1.31	4.3
85	3	0.6 (1.5)	85/71	20.1	15.9	23.1	0.97	20.7	70	0.7 (1.6)	60	21.3	18.0	1.04	6.0
			75/63	16.4	14.3	19.9	1.14	14.4			70	20.7	16.9	1.17	5.2
			80/67	17.5	14.9	21.0	1.13	15.4			80	20.1	15.9	1.32	4.5
	4	1.1 (2.5)	85/71	18.7	15.3	22.2	1.13	16.6		1.2 (2.7)	60	22.0	18.7	1.04	6.2
			75/63	16.8	14.4	20.1	1.10	15.2			70	21.3	17.6	1.17	5.3
			80/67	17.9	15.0	21.2	1.09	16.4			80	20.7	16.5	1.32	4.6
	6	2.3 (5.3)	85/71	19.1	15.5	22.4	1.08	17.6		2.4 (5.5)	60	22.8	19.5	1.04	6.5
			75/63	17.1	14.6	20.3	1.06	16.1			70	22.1	18.3	1.17	5.6
			80/67	18.3	15.1	21.5	1.05	17.4			80	21.4	17.1	1.32	4.7
90	3	0.6 (1.5)	85/71	19.5	15.6	22.7	1.03	18.8	80	0.7 (1.5)	60	23.5	20.3	1.03	6.7
			75/63	15.9	14.1	19.5	1.21	13.1			70	22.9	19.2	1.17	5.8
			80/67	17.0	14.6	20.7	1.20	14.1			80	22.3	18.0	1.32	5.0
	4	1.1 (2.5)	85/71	18.1	15.1	21.8	1.20	15.1		1.1 (2.6)	60	24.4	21.1	1.03	7.0
			75/63	16.2	14.2	19.7	1.17	13.8			70	23.6	19.9	1.16	6.0
			80/67	17.3	14.8	20.9	1.16	14.9			80	22.9	18.7	1.32	5.1
	6	2.3 (5.2)	85/71	18.5	15.3	22.0	1.15	16.1		2.3 (5.4)	60	25.3	22.1	1.03	7.2
			75/63	16.5	14.3	20.0	1.13	14.6			70	24.4	20.8	1.16	6.2
			80/67	17.7	14.9	21.1	1.12	15.8			80	23.7	19.5	1.32	5.3
100	3	0.6 (1.4)	85/71	18.9	15.4	22.3	1.10	17.1	Operation Not Recommended						
			75/63	14.8	13.6	18.9	1.36	10.9							
			80/67	15.8	14.2	19.9	1.36	11.6							
	4	1.0 (2.4)	85/71	16.9	14.7	21.0	1.35	12.5							
			75/63	15.1	13.7	19.0	1.32	11.4							
			80/67	16.2	14.3	20.1	1.31	12.3							
	6	2.2 (5.0)	85/71	17.2	14.9	21.2	1.30	13.2							
			75/63	15.4	13.9	19.2	1.28	12.0							
			80/67	16.5	14.4	20.3	1.26	13.0							
110	3	0.6 (1.4)	85/71	17.6	15.0	21.5	1.25	14.0							
			75/63	13.7	13.2	18.3	1.53	9.0							
			80/67	14.7	13.7	19.3	1.53	9.6							
	4	1.0 (2.4)	85/71	15.7	14.3	20.3	1.52	10.3							
			75/63	14.0	13.3	18.4	1.48	9.4							
			80/67	15.0	13.9	19.4	1.48	10.1							
	6	2.1 (4.9)	85/71	16.0	14.4	20.5	1.47	10.8							
			75/63	14.2	13.4	18.5	1.44	9.8							
			80/67	15.3	14.0	19.6	1.43	10.6							

50PTH,PTV024

825 CFM AT 0.23-in. ESP — FULL LOAD

COOLING									HEATING						
Entering Fluid Temp (F)	Water Flow (GPM)	Pressure Drop PSI (FOH)	Entering Air Temp (db/wb) F	Total Capacity (MBtuh)	Sensible Capacity (MBtuh)	Heat of Rejection (MBtuh)	Power Input (kW)	EER	Entering Fluid Temp (F)	Pressure Drop PSI (FOH)	Entering Air Temp (F)	Total Capacity (MBtuh)	Heat of Absorption (MBtuh)	Power Input (kW)	COP
50	3	0.7 (1.7)	75/63	27.1	20.7	31.3	1.27	21.4	30	0.8 (1.8)	60	18.1	13.5	1.38	3.8
			80/67	28.9	21.2	33.1	1.29	22.5			70	17.6	12.6	1.52	3.4
			85/71	30.7	21.8	35.0	1.30	23.6			80	17.4	11.7	1.67	3.0
	4	1.3 (2.9)	75/63	27.8	21.0	31.8	1.20	23.1		1.3 (3.1)	60	18.6	14.1	1.39	3.9
			80/67	29.6	21.6	33.6	1.22	24.3			70	18.2	13.1	1.53	3.5
			85/71	31.5	22.1	35.6	1.24	25.5			80	17.8	12.2	1.68	3.1
	6	2.6 (5.9)	75/63	28.5	21.3	32.3	1.14	25.1		2.8 (6.4)	60	19.3	14.7	1.41	4.0
			80/67	30.4	21.9	34.2	1.15	26.5			70	18.8	13.7	1.55	3.6
			85/71	32.4	22.4	36.3	1.16	27.9			80	18.4	12.7	1.69	3.2
60	3	0.7 (1.6)	75/63	25.9	20.2	30.4	1.38	18.8	40	0.8 (1.8)	60	20.4	15.7	1.43	4.2
			80/67	27.5	20.8	32.1	1.40	19.7			70	20.0	14.8	1.57	3.7
			85/71	29.3	21.3	34.0	1.41	20.8			80	19.6	13.9	1.72	3.3
	4	1.2 (2.8)	75/63	26.6	20.4	30.9	1.32	20.2		1.3 (3.0)	60	21.2	16.5	1.44	4.3
			80/67	28.2	21.1	32.6	1.34	21.1			70	20.7	15.5	1.58	3.8
			85/71	30.1	21.6	34.5	1.35	22.4			80	20.2	14.5	1.74	3.4
	6	2.5 (5.7)	75/63	27.2	20.7	31.4	1.26	21.6		2.7 (6.1)	60	22.0	17.3	1.46	4.4
			80/67	29.0	21.3	33.2	1.27	22.8			70	21.5	16.2	1.60	3.9
			85/71	30.9	22.0	35.2	1.28	24.2			80	20.9	15.1	1.75	3.5
70	3	0.7 (1.6)	75/63	24.6	19.7	29.4	1.49	16.5	50	0.7 (1.7)	60	23.1	18.2	1.48	4.6
			80/67	26.2	20.2	31.1	1.51	17.3			70	22.5	17.2	1.62	4.1
			85/71	27.9	20.8	32.9	1.53	18.3			80	22.1	16.1	1.78	3.6
	4	1.2 (2.7)	75/63	25.2	19.9	29.9	1.44	17.6		1.2 (2.9)	60	24.0	19.0	1.50	4.7
			80/67	26.9	20.5	31.6	1.45	18.5			70	23.4	18.0	1.64	4.2
			85/71	28.6	21.1	33.4	1.46	19.6			80	22.9	16.8	1.80	3.7
	6	2.4 (5.5)	75/63	25.9	20.1	30.4	1.38	18.8		2.6 (5.9)	60	25.2	20.0	1.52	4.8
			80/67	27.6	20.8	32.1	1.39	19.9			70	24.4	18.9	1.66	4.3
			85/71	29.5	21.3	34.1	1.40	21.1			80	23.8	17.7	1.82	3.8
80	3	0.6 (1.5)	75/63	23.4	19.1	28.5	1.62	14.4	60	0.7 (1.6)	60	25.9	20.8	1.54	4.9
			80/67	24.9	19.7	30.1	1.64	15.2			70	25.3	19.8	1.68	4.4
			85/71	26.4	20.3	31.8	1.66	16.0			80	24.9	18.6	1.83	4.0
	4	1.1 (2.6)	75/63	23.9	19.3	29.0	1.56	15.3		1.2 (2.8)	60	27.0	21.8	1.55	5.1
			80/67	25.5	20.0	30.6	1.58	16.2			70	26.3	20.8	1.69	4.5
			85/71	27.2	20.5	32.4	1.59	17.1			80	25.8	19.5	1.85	4.1
	6	2.3 (5.4)	75/63	24.5	19.6	29.4	1.50	16.3		2.5 (5.7)	60	28.2	23.1	1.58	5.2
			80/67	26.2	20.3	31.1	1.52	17.3			70	27.5	21.8	1.72	4.7
			85/71	28.0	20.8	32.9	1.52	18.4			80	26.8	20.5	1.87	4.2
85	3	0.6 (1.5)	75/63	22.7	18.8	28.0	1.69	13.4	70	0.7 (1.6)	60	28.8	23.6	1.59	5.3
			80/67	24.1	19.5	29.6	1.71	14.1			70	28.2	22.5	1.73	4.8
			85/71	25.7	20.1	31.3	1.73	14.9			80	27.6	21.3	1.89	4.3
	4	1.1 (2.5)	75/63	23.3	19.0	28.5	1.63	14.3		1.2 (2.7)	60	30.4	24.8	1.61	5.5
			80/67	24.8	19.7	30.1	1.65	15.1			70	29.3	23.6	1.75	4.9
			85/71	26.4	20.3	31.8	1.66	16.0			80	29.0	22.2	1.91	4.4
	6	2.3 (5.3)	75/63	23.9	19.3	28.9	1.57	15.2		2.4 (5.5)	60	31.6	26.2	1.63	5.7
			80/67	25.4	20.0	30.5	1.58	16.1			70	30.7	24.9	1.77	5.1
			85/71	27.2	20.5	32.4	1.59	17.1			80	30.2	23.4	1.93	4.6
90	3	0.6 (1.5)	75/63	22.0	18.5	27.7	1.77	12.5	80	0.7 (1.5)	60	32.2	26.5	1.64	5.8
			80/67	23.5	19.2	29.2	1.79	13.2			70	31.1	25.3	1.78	5.1
			85/71	24.9	19.8	30.7	1.80	13.9			80	30.8	23.9	1.94	4.6
	4	1.1 (2.5)	75/63	22.5	18.8	28.0	1.71	13.2		1.1 (2.6)	60	33.7	27.9	1.66	5.9
			80/67	24.0	19.4	29.5	1.72	14.0			70	32.5	26.6	1.81	5.3
			85/71	25.7	20.0	31.3	1.73	14.9			80	31.7	25.2	1.97	4.7
	6	2.3 (5.2)	75/63	23.2	19.0	28.4	1.64	14.1		2.3 (5.4)	60	35.0	29.5	1.69	6.1
			80/67	24.7	19.6	30.0	1.66	14.9			70	34.0	28.0	1.83	5.4
			85/71	26.4	20.3	31.7	1.66	15.9			80	33.4	26.3	2.00	4.9
100	3	0.6 (1.4)	75/63	20.7	18.0	26.8	1.93	10.7	Operation Not Recommended						
			80/67	22.1	18.7	28.3	1.95	11.4							
			85/71	23.6	19.3	29.8	1.97	12.0							
	4	1.0 (2.4)	75/63	21.2	18.2	27.1	1.87	11.4							
			80/67	22.7	18.9	28.7	1.88	12.1							
			85/71	24.1	19.5	30.2	1.89	12.8							
	6	2.2 (5.0)	75/63	21.7	18.4	27.4	1.80	12.1							
			80/67	23.2	19.1	29.0	1.81	12.8							
			85/71	24.8	19.7	30.7	1.82	13.7							
110	3	0.6 (1.4)	75/63	19.4	17.5	26.1	2.12	9.2							
			80/67	20.7	18.2	27.5	2.14	9.7							
			85/71	22.1	18.8	28.9	2.16	10.3							
	4	1.0 (2.4)	75/63	19.9	17.6	26.4	2.06	9.7							
			80/67	21.3	18.3	27.8	2.07	10.3							
			85/71	22.7	19.0	29.3	2.08	11.0							
	6	2.1 (4.9)	75/63	20.4	17.8	26.6	1.99	10.3							
			80/67	21.8	18.6	28.1	1.99	11.0							
			85/71	23.3	19.2	29.7	2.00	11.7							

Performance data (cont)

Carrier
United Technologies

50PTH,PTV036

800 CFM AT 0.58-in. ESP — PART LOAD

COOLING									HEATING						
Entering Fluid Temp (F)	Water Flow (GPM)	Pressure Drop PSI (FOH)	Entering Air Temp (db/wb) F	Total Capacity (MBtuh)	Sensible Capacity (MBtuh)	Heat of Rejection (MBtuh)	Power Input (kW)	EER	Entering Fluid Temp (F)	Pressure Drop PSI (FOH)	Entering Air Temp (F)	Total Capacity (MBtuh)	Heat of Absorption (MBtuh)	Power Input (kW)	COP
50	4.5	1.4 (3.2)	75/63	29.9	21.8	33.2	1.01	29.6	30	1.5 (3.4)	60	18.4	13.6	1.46	3.7
			80/67	32.0	22.4	35.3	1.00	32.1			70	17.9	12.5	1.65	3.2
			85/71	34.2	23.0	37.5	0.98	34.9			80	17.7	11.4	1.87	2.8
	6.0	2.3 (5.4)	75/63	30.4	22.0	33.6	0.99	30.9		2.5 (5.7)	60	18.8	14.0	1.47	3.8
			80/67	32.5	22.7	35.7	0.97	33.6			70	18.3	12.9	1.65	3.2
			85/71	34.8	23.3	38.0	0.95	36.7			80	18.0	11.7	1.87	2.8
	9.0	4.8 (11.1)	75/63	30.8	22.2	34.0	0.96	32.0		5.2 (11.9)	60	19.3	14.5	1.47	3.8
			80/67	33.1	22.8	36.2	0.94	35.1			70	18.9	13.4	1.66	3.3
			85/71	35.4	23.5	38.5	0.92	38.5			80	18.3	12.4	1.87	2.9
60	4.5	1.3 (3.1)	75/63	28.5	21.2	32.1	1.11	25.7	40	1.4 (3.3)	60	21.3	16.4	1.48	4.2
			80/67	30.5	21.9	34.1	1.10	27.9			70	20.8	15.3	1.67	3.6
			85/71	32.7	22.4	36.3	1.08	30.3			80	20.3	14.1	1.89	3.1
	6.0	2.3 (5.2)	75/63	29.0	21.4	32.4	1.07	27.0		2.4 (5.5)	60	21.9	17.0	1.49	4.3
			80/67	31.1	22.1	34.5	1.06	29.4			70	21.3	15.8	1.67	3.7
			85/71	33.3	22.6	36.7	1.04	32.0			80	20.8	14.5	1.89	3.2
	9.0	4.6 (10.7)	75/63	29.4	21.6	32.8	1.04	28.2		5.0 (11.5)	60	22.5	17.6	1.49	4.4
			80/67	31.6	22.3	34.9	1.02	30.9			70	21.9	16.3	1.68	3.8
			85/71	33.9	22.9	37.2	1.00	33.9			80	21.4	15.1	1.90	3.3
70	4.5	1.3 (3.0)	75/63	27.1	20.6	31.0	1.23	22.0	50	1.4 (3.2)	60	24.4	19.4	1.50	4.8
			80/67	29.1	21.2	33.0	1.22	23.8			70	23.8	18.1	1.69	4.1
			85/71	31.1	21.9	35.0	1.21	25.7			80	23.5	16.8	1.92	3.6
	6.0	2.2 (5.0)	75/63	27.5	20.8	31.3	1.19	23.1		2.3 (5.4)	60	25.1	20.1	1.51	4.9
			80/67	29.6	21.4	33.4	1.18	25.1			70	24.4	18.8	1.70	4.2
			85/71	31.7	22.1	35.5	1.16	27.2			80	23.9	17.5	1.92	3.6
	9.0	4.5 (10.4)	75/63	27.9	21.0	31.7	1.16	24.2		4.8 (11.1)	60	25.9	20.9	1.51	5.0
			80/67	30.0	21.6	33.7	1.14	26.4			70	25.1	19.5	1.70	4.3
			85/71	32.3	22.2	35.9	1.12	28.9			80	24.6	18.1	1.93	3.7
80	4.5	1.3 (2.9)	75/63	25.7	19.9	30.1	1.39	18.5	60	1.3 (3.1)	60	27.6	22.6	1.52	5.3
			80/67	27.5	20.7	31.9	1.38	19.9			70	26.9	21.2	1.72	4.6
			85/71	29.5	21.3	33.9	1.37	21.5			80	26.3	19.6	1.95	4.0
	6.0	2.1 (4.8)	75/63	26.1	20.1	30.3	1.35	19.4		2.2 (5.2)	60	28.4	23.4	1.52	5.5
			80/67	28.0	20.8	32.3	1.33	21.0			70	27.7	22.0	1.73	4.7
			85/71	30.1	21.4	34.3	1.32	22.8			80	27.0	20.5	1.95	4.0
	9.0	4.4 (10.1)	75/63	26.5	20.3	30.6	1.30	20.4		4.6 (10.7)	60	29.4	24.4	1.53	5.6
			80/67	28.4	21.0	32.6	1.29	22.1			70	28.5	22.8	1.73	4.8
			85/71	30.5	21.7	34.6	1.27	24.1			80	28.0	21.1	1.97	4.2
85	4.5	1.2 (2.8)	75/63	24.9	19.7	29.6	1.48	16.8	70	1.3 (3.0)	60	30.9	25.9	1.54	5.9
			80/67	26.8	20.3	31.5	1.47	18.2			70	30.0	24.2	1.74	5.0
			85/71	28.7	21.0	33.4	1.47	19.6			80	29.7	22.7	1.99	4.4
	6.0	2.1 (4.8)	75/63	25.3	19.8	29.9	1.43	17.7		2.2 (5.0)	60	31.9	26.9	1.54	6.1
			80/67	27.2	20.5	31.7	1.42	19.2			70	31.0	25.3	1.75	5.2
			85/71	29.2	21.2	33.7	1.41	20.8			80	30.3	23.6	1.99	4.5
	9.0	4.3 (9.9)	75/63	25.7	19.9	30.1	1.39	18.5		4.5 (10.4)	60	33.0	28.0	1.54	6.3
			80/67	27.6	20.7	32.0	1.37	20.1			70	32.0	26.3	1.76	5.3
			85/71	29.7	21.3	34.1	1.35	21.9			80	31.2	24.4	2.00	4.6
90	4.5	1.2 (2.8)	75/63	24.1	19.3	29.1	1.58	15.3	80	1.2 (2.9)	60	34.4	28.7	1.55	6.5
			80/67	26.0	20.1	30.9	1.57	16.6			70	33.2	27.5	1.77	5.5
			85/71	27.9	20.7	32.8	1.57	17.8			80	32.8	25.8	2.02	4.8
	6.0	2.0 (4.7)	75/63	24.5	19.5	29.3	1.53	16.0		2.1 (4.8)	60	35.4	30.5	1.55	6.7
			80/67	26.4	20.2	31.3	1.52	17.4			70	34.4	28.6	1.78	5.7
			85/71	28.4	20.8	33.2	1.51	18.9			80	33.8	26.4	2.03	4.9
	9.0	4.2 (9.7)	75/63	24.9	19.6	29.6	1.48	16.8		4.4 (10.1)	60	36.7	31.8	1.56	6.9
			80/67	26.8	20.3	31.5	1.47	18.3			70	35.6	29.9	1.79	5.8
			85/71	28.8	21.0	33.5	1.45	19.9			80	35.0	27.6	2.04	5.0
100	4.5	1.2 (2.7)	75/63	22.7	18.7	28.3	1.80	12.7	Operation Not Recommended						
			80/67	24.4	19.4	30.0	1.79	13.6							
			85/71	26.2	20.0	31.9	1.79	14.7							
	6.0	2.0 (4.6)	75/63	23.0	18.9	28.5	1.74	13.2							
			80/67	24.8	19.5	30.3	1.73	14.3							
			85/71	26.6	20.3	32.1	1.72	15.5							
	9.0	4.1 (9.5)	75/63	23.3	19.0	28.7	1.69	13.8							
			80/67	25.1	19.7	30.4	1.68	14.9							
			85/71	27.1	20.4	32.4	1.67	16.3							
110	4.5	1.1 (2.6)	75/63	21.1	18.1	27.5	2.04	10.3							
			80/67	22.8	18.8	29.2	2.04	11.2							
			85/71	24.5	19.5	30.9	2.03	12.1							
	6.0	1.9 (4.4)	75/63	21.4	18.2	27.7	1.99	10.8							
			80/67	23.1	19.0	29.4	1.98	11.7							
			85/71	24.9	19.6	31.1	1.97	12.6							
	9.0	4.0 (9.2)	75/63	21.8	18.3	27.8	1.94	11.3							
			80/67	23.5	19.1	29.5	1.92	12.2							
			85/71	25.3	19.7	31.4	1.91	13.2							

50PTH,PTV036

1,100 CFM AT 0.25-in. ESP — FULL LOAD

COOLING									HEATING						
Entering Fluid Temp (F)	Water Flow (GPM)	Pressure Drop PSI (FOH)	Entering Air Temp (db/wb) F	Total Capacity (MBtuh)	Sensible Capacity (MBtuh)	Heat of Rejection (MBtuh)	Power Input (kW)	EER	Entering Fluid Temp (F)	Pressure Drop PSI (FOH)	Entering Air Temp (F)	Total Capacity (MBtuh)	Heat of Absorption (MBtuh)	Power Input (kW)	COP
50	4.5	1.4 (3.2)	75/63	40.9	29.9	46.4	1.69	24.2	30	1.5 (3.4)	60	25.9	19.5	1.93	3.9
			80/67	43.6	30.6	49.3	1.74	25.1			70	25.6	18.3	2.15	3.5
			85/71	46.4	31.4	52.3	1.78	26.1			80	25.6	17.1	2.40	3.1
	6.0	2.3 (5.4)	75/63	41.6	30.2	47.0	1.64	25.3		2.5 (5.7)	60	26.8	20.2	1.95	4.0
			80/67	44.4	31.0	50.0	1.69	26.4			70	26.3	19.0	2.17	3.5
			85/71	47.4	31.7	53.1	1.73	27.4			80	26.3	17.7	2.42	3.2
	9.0	4.8 (11.1)	75/63	42.4	30.6	47.7	1.60	26.6		5.2 (11.9)	60	27.7	21.1	1.97	4.1
			80/67	45.3	31.4	50.7	1.64	27.6			70	27.2	19.8	2.19	3.6
			85/71	48.3	32.1	54.0	1.69	28.7			80	27.1	18.3	2.44	3.3
60	4.5	1.3 (3.1)	75/63	39.2	29.1	45.2	1.82	21.6	40	1.4 (3.3)	60	29.6	22.9	2.01	4.3
			80/67	41.8	30.0	47.9	1.86	22.5			70	29.1	21.6	2.23	3.8
			85/71	44.6	30.7	50.8	1.89	23.6			80	28.7	20.3	2.48	3.4
	6.0	2.3 (5.2)	75/63	40.0	29.4	45.7	1.76	22.7		2.4 (5.5)	60	30.7	23.9	2.03	4.4
			80/67	42.6	30.3	48.5	1.79	23.8			70	30.1	22.5	2.25	3.9
			85/71	45.5	31.1	51.5	1.83	24.9			80	29.5	21.1	2.50	3.4
	9.0	4.6 (10.7)	75/63	40.7	29.8	46.3	1.71	23.9		5.0 (11.5)	60	31.9	25.0	2.05	4.5
			80/67	43.5	30.5	49.3	1.74	25.0			70	31.1	23.5	2.28	4.0
			85/71	46.4	31.4	52.3	1.78	26.2			80	30.5	22.0	2.53	3.5
70	4.5	1.3 (3.0)	75/63	37.5	28.4	43.9	1.97	19.0	50	1.4 (3.2)	60	33.6	26.6	2.09	4.7
			80/67	40.0	29.1	46.6	2.01	19.9			70	32.9	25.1	2.32	4.2
			85/71	42.6	30.0	49.3	2.04	20.9			80	32.8	23.5	2.57	3.7
	6.0	2.2 (5.0)	75/63	38.2	28.7	44.4	1.91	20.1		2.3 (5.4)	60	34.9	27.8	2.12	4.8
			80/67	40.8	29.5	47.2	1.94	21.1			70	34.1	26.2	2.34	4.3
			85/71	43.5	30.4	50.0	1.96	22.2			80	34.1	24.5	2.60	3.8
	9.0	4.5 (10.4)	75/63	38.9	29.0	44.9	1.85	21.1		4.8 (11.1)	60	36.3	29.1	2.15	4.9
			80/67	41.6	29.8	47.8	1.87	22.2			70	35.4	27.5	2.37	4.4
			85/71	44.5	30.6	50.8	1.90	23.4			80	35.3	25.5	2.62	3.9
80	4.5	1.3 (2.9)	75/63	35.7	27.7	42.7	2.16	16.5	60	1.3 (3.1)	60	37.8	30.5	2.18	5.1
			80/67	38.1	28.5	45.2	2.19	17.4			70	37.0	28.9	2.40	4.5
			85/71	40.7	29.3	47.9	2.22	18.4			80	36.3	27.3	2.65	4.0
	6.0	2.1 (4.8)	75/63	36.5	27.9	43.2	2.09	17.5		2.2 (5.2)	60	39.3	31.9	2.21	5.2
			80/67	38.9	28.8	45.7	2.11	18.5			70	38.4	30.2	2.43	4.6
			85/71	41.6	29.6	48.5	2.13	19.5			80	37.6	28.5	2.68	4.1
	9.0	4.4 (10.1)	75/63	37.1	28.2	43.6	2.02	18.4		4.6 (10.7)	60	41.0	33.5	2.25	5.3
			80/67	39.6	29.1	46.3	2.04	19.5			70	40.0	31.7	2.46	4.8
			85/71	42.5	29.8	49.2	2.06	20.7			80	39.0	29.8	2.71	4.2
85	4.5	1.2 (2.8)	75/63	34.8	27.3	42.1	2.27	15.4	70	1.3 (3.0)	60	42.2	34.6	2.27	5.4
			80/67	37.2	28.1	44.6	2.29	16.2			70	41.2	32.8	2.49	4.8
			85/71	39.8	28.8	47.3	2.32	17.2			80	40.4	31.1	2.75	4.3
	6.0	2.1 (4.8)	75/63	35.5	27.6	42.5	2.19	16.2		2.2 (5.0)	60	44.0	36.2	2.31	5.6
			80/67	38.0	28.4	45.2	2.21	17.2			70	42.9	34.4	2.53	5.0
			85/71	40.5	29.2	47.8	2.23	18.2			80	41.9	32.5	2.78	4.4
	9.0	4.3 (9.9)	75/63	36.1	27.7	43.0	2.12	17.0		4.5 (10.4)	60	46.0	38.1	2.36	5.7
			80/67	38.6	28.7	45.6	2.14	18.1			70	44.7	36.1	2.57	5.1
			85/71	41.4	29.5	48.4	2.15	19.3			80	43.5	34.0	2.82	4.5
90	4.5	1.2 (2.8)	75/63	34.0	26.8	41.6	2.38	14.3	80	1.2 (2.9)	60	46.7	38.8	2.37	5.8
			80/67	36.3	27.7	44.1	2.41	15.1			70	46.0	36.8	2.59	5.2
			85/71	38.8	28.5	46.6	2.43	16.0			80	44.6	35.0	2.85	4.6
	6.0	2.0 (4.7)	75/63	34.6	27.2	42.0	2.30	15.1		2.1 (4.8)	60	48.8	40.7	2.42	5.9
			80/67	37.0	28.1	44.5	2.32	16.0			70	47.5	38.6	2.64	5.3
			85/71	39.5	28.9	47.1	2.34	16.9			80	46.4	36.6	2.89	4.7
	9.0	4.2 (9.7)	75/63	35.2	27.4	42.3	2.23	15.8		4.4 (10.1)	60	51.1	42.8	2.48	6.0
			80/67	37.7	28.2	45.0	2.25	16.8			70	49.6	40.6	2.69	5.4
			85/71	40.4	29.1	47.7	2.26	17.9			80	48.2	38.3	2.94	4.8
100	4.5	1.2 (2.7)	75/63	32.1	26.1	40.5	2.63	12.2	Operation Not Recommended						
			80/67	34.4	26.9	43.0	2.66	13.0							
			85/71	36.7	27.9	45.3	2.68	13.7							
	6.0	2.0 (4.6)	75/63	32.7	26.3	40.9	2.55	12.8							
			80/67	35.0	27.3	43.3	2.57	13.7							
			85/71	37.4	28.1	45.8	2.58	14.5							
	9.0	4.1 (9.5)	75/63	33.3	26.6	41.2	2.47	13.5							
			80/67	35.7	27.5	43.7	2.48	14.4							
			85/71	38.1	28.4	46.2	2.49	15.3							
110	4.5	1.1 (2.6)	75/63	30.3	25.3	39.7	2.92	10.4							
			80/67	32.4	26.3	41.9	2.94	11.0							
			85/71	34.7	27.1	44.3	2.96	11.7							
	6.0	1.9 (4.4)	75/63	30.8	25.5	39.9	2.84	10.9							
			80/67	33.1	26.5	42.2	2.85	11.6							
			85/71	35.4	27.3	44.6	2.86	12.4							
	9.0	4.0 (9.2)	75/63	31.5	25.8	40.2	2.74	11.5							
			80/67	33.7	26.7	42.6	2.75	12.3							
			85/71	36.1	27.6	45.0	2.77	13.1							

Performance data (cont)

Carrier
United Technologies

50PTH,PTV048

1,300 CFM AT 0.27-in. ESP — PART LOAD

COOLING									HEATING						
Entering Fluid Temp (F)	Water Flow (GPM)	Pressure Drop PSI (FOH)	Entering Air Temp (db/wb) F	Total Capacity (MBtuh)	Sensible Capacity (MBtuh)	Heat of Rejection (MBtuh)	Power Input (kW)	EER	Entering Fluid Temp (F)	Pressure Drop PSI (FOH)	Entering Air Temp (F)	Total Capacity (MBtuh)	Heat of Absorption (MBtuh)	Power Input (kW)	COP
50	6	1.1 (2.6)	75/63	39.8	31.6	44.5	1.43	27.8	30	1.2 (2.8)	60	25.7	19.3	1.95	3.9
			80/67	42.6	32.6	47.2	1.41	30.2			70	24.8	17.7	2.18	3.3
			85/71	45.3	33.5	49.9	1.39	32.7			80	24.0	16.0	2.44	2.9
	8	1.9 (4.4)	75/63	40.7	32.0	45.2	1.36	30.0		2.0 (4.7)	60	26.4	20.0	1.95	4.0
			80/67	43.6	33.0	47.9	1.33	32.8			70	25.5	18.3	2.18	3.4
			85/71	46.4	34.0	50.7	1.30	35.8			80	24.6	16.6	2.44	3.0
	12	3.9 (9.1)	75/63	41.7	32.4	45.9	1.28	32.6		4.2 (9.8)	60	27.2	20.8	1.95	4.1
			80/67	44.6	33.4	48.7	1.24	35.8			70	26.2	19.0	2.18	3.5
			85/71	47.6	34.3	51.7	1.21	39.4			80	25.2	17.2	2.45	3.0
60	6	1.1 (2.5)	75/63	37.7	30.6	43.0	1.63	23.1	40	1.2 (2.7)	60	29.3	22.9	1.96	4.4
			80/67	40.3	31.7	45.5	1.61	25.1			70	28.4	21.1	2.20	3.8
			85/71	43.0	32.6	48.2	1.58	27.1			80	27.6	19.4	2.47	3.3
	8	1.9 (4.3)	75/63	38.5	31.1	43.5	1.55	24.8		2.0 (4.6)	60	30.2	23.8	1.96	4.5
			80/67	41.2	32.1	46.2	1.52	27.0			70	29.2	21.9	2.20	3.9
			85/71	44.0	33.1	48.9	1.49	29.5			80	28.3	20.1	2.47	3.4
	12	3.8 (8.8)	75/63	39.4	31.4	44.2	1.47	26.8		4.1 (9.5)	60	31.2	24.7	1.96	4.7
			80/67	42.2	32.5	46.9	1.44	29.4			70	30.1	22.8	2.21	4.0
			85/71	45.2	33.4	49.8	1.40	32.2			80	29.1	20.9	2.48	3.4
70	6	1.1 (2.5)	75/63	35.5	29.7	41.4	1.85	19.2	50	1.1 (2.6)	60	33.3	26.8	1.97	5.0
			80/67	38.0	30.9	43.8	1.82	20.8			70	32.3	24.9	2.22	4.3
			85/71	40.6	31.8	46.5	1.80	22.5			80	31.4	23.1	2.50	3.7
	8	1.8 (4.1)	75/63	36.3	30.0	41.9	1.77	20.5		1.9 (4.4)	60	34.4	27.9	1.97	5.1
			80/67	38.9	31.2	44.5	1.74	22.4			70	33.3	25.9	2.22	4.4
			85/71	41.5	32.2	47.1	1.71	24.3			80	32.4	23.9	2.50	3.8
	12	3.7 (8.6)	75/63	37.1	30.4	42.5	1.69	22.0		4.0 (9.1)	60	35.6	29.1	1.97	5.3
			80/67	39.7	31.6	45.1	1.65	24.0			70	34.4	27.0	2.23	4.5
			85/71	42.6	32.5	47.9	1.62	26.3			80	33.4	24.9	2.50	3.9
80	6	1.0 (2.4)	75/63	33.2	28.9	39.8	2.09	15.9	60	1.1 (2.5)	60	37.5	31.0	1.98	5.5
			80/67	35.6	30.0	42.2	2.07	17.2			70	36.5	29.0	2.23	4.8
			85/71	38.2	31.0	44.8	2.05	18.7			80	35.5	27.1	2.51	4.1
	8	1.7 (4.0)	75/63	33.9	29.2	40.3	2.01	16.9		1.8 (4.3)	60	38.9	32.3	1.98	5.8
			80/67	36.4	30.3	42.8	1.98	18.4			70	37.7	30.2	2.24	4.9
			85/71	39.0	31.4	45.3	1.95	20.0			80	36.6	28.2	2.52	4.3
	12	3.6 (8.3)	75/63	34.7	29.5	40.8	1.92	18.0		3.8 (8.8)	60	40.3	33.8	1.98	6.0
			80/67	37.3	30.6	43.4	1.89	19.7			70	39.0	31.6	2.24	5.1
			85/71	40.0	31.7	46.0	1.86	21.5			80	37.8	29.4	2.52	4.4
85	6	1.0 (2.3)	75/63	32.1	28.4	39.2	2.22	14.5	70	1.1 (2.5)	60	42.0	35.5	1.98	6.2
			80/67	34.5	29.5	41.5	2.20	15.7			70	40.9	33.4	2.24	5.3
			85/71	37.0	30.6	44.0	2.18	17.0			80	39.8	31.3	2.53	4.6
	8	1.7 (3.9)	75/63	32.8	28.7	39.6	2.13	15.4		1.8 (4.1)	60	43.6	37.1	1.98	6.4
			80/67	35.3	29.8	42.0	2.11	16.7			70	42.3	34.8	2.25	5.5
			85/71	37.8	30.8	44.5	2.08	18.1			80	41.1	32.6	2.54	4.8
	12	3.5 (8.1)	75/63	33.5	29.0	40.0	2.05	16.3		3.7 (8.6)	60	45.3	38.8	1.98	6.7
			80/67	36.0	30.2	42.5	2.02	17.8			70	43.9	36.4	2.25	5.7
			85/71	38.7	31.3	45.1	1.99	19.5			80	42.5	34.0	2.54	4.9
90	6	1.0 (2.3)	75/63	31.0	28.0	38.4	2.35	13.2	80	1.0 (2.4)	60	46.7	40.2	1.98	6.9
			80/67	33.3	29.1	40.7	2.34	14.2			70	45.5	38.0	2.25	5.9
			85/71	35.7	30.2	43.1	2.32	15.4			80	44.3	35.8	2.55	5.1
	8	1.7 (3.9)	75/63	31.7	28.2	38.9	2.27	14.0		1.7 (4.0)	60	48.5	42.0	1.98	7.2
			80/67	34.0	29.4	41.2	2.25	15.1			70	47.1	39.6	2.26	6.1
			85/71	36.6	30.4	43.7	2.22	16.5			80	45.8	37.2	2.55	5.3
	12	3.5 (8.0)	75/63	32.3	28.5	39.3	2.19	14.8		3.6 (8.3)	60	50.5	44.0	1.98	7.5
			80/67	34.9	29.6	41.7	2.16	16.2			70	48.9	41.5	2.26	6.3
			85/71	37.5	30.7	44.3	2.12	17.7			80	47.4	38.9	2.56	5.4
100	6	1.0 (2.2)	75/63	28.8	27.0	37.1	2.64	10.9	Operation Not Recommended						
			80/67	31.0	28.3	39.3	2.63	11.8							
			85/71	33.3	29.4	41.6	2.61	12.7							
	8	1.6 (3.8)	75/63	29.4	27.3	37.4	2.56	11.5							
			80/67	31.6	28.5	39.7	2.54	12.4							
			85/71	34.0	29.7	42.0	2.52	13.5							
	12	3.4 (7.8)	75/63	30.0	27.6	37.8	2.48	12.1							
			80/67	32.4	28.7	40.2	2.45	13.2							
			85/71	34.8	29.9	42.5	2.42	14.4							
110	6	1.0 (2.2)	75/63	26.6	26.2	35.9	2.96	9.0							
			80/67	28.7	27.4	38.0	2.95	9.7							
			85/71	30.5	28.5	39.9	2.94	10.4							
	8	1.6 (3.6)	75/63	27.1	26.4	36.1	2.88	9.4							
			80/67	29.3	27.7	38.3	2.86	10.2							
			85/71	31.5	28.8	40.5	2.84	11.1							
	12	3.3 (7.6)	75/63	27.7	26.6	36.5	2.80	9.9							
			80/67	29.9	27.9	38.7	2.77	10.8							
			85/71	32.2	29.1	41.0	2.74	11.7							

50PTH,PTV048

1,600 CFM AT 0.60-in. ESP — FULL LOAD

COOLING									HEATING						
Entering Fluid Temp (F)	Water Flow (GPM)	Pressure Drop PSI (FOH)	Entering Air Temp (db/wb) F	Total Capacity (MBtuh)	Sensible Capacity (MBtuh)	Heat of Rejection (MBtuh)	Power Input (kW)	EER	Entering Fluid Temp (F)	Pressure Drop PSI (FOH)	Entering Air Temp (F)	Total Capacity (MBtuh)	Heat of Absorption (MBtuh)	Power Input (kW)	COP
50	6	1.1 (2.6)	75/63	52.4	40.1	60.5	2.47	21.2	30	1.2 (2.8)	60	34.5	25.7	2.67	3.8
			80/67	55.8	41.4	64.0	2.50	22.3			70	34.0	24.2	2.98	3.3
			85/71	59.4	42.3	67.7	2.53	23.5			80	34.2	22.4	3.32	3.0
	8	1.9 (4.4)	75/63	53.7	40.7	61.4	2.36	22.8		2.0 (4.7)	60	35.8	26.9	2.70	3.9
			80/67	57.2	41.9	65.0	2.38	24.1			70	35.4	25.1	3.01	3.4
			85/71	61.0	42.9	68.9	2.40	25.5			80	34.9	23.4	3.34	3.1
	12	3.9 (9.1)	75/63	55.0	41.3	62.4	2.24	24.6		4.2 (9.8)	60	37.3	28.2	2.73	4.0
			80/67	58.8	42.4	66.3	2.25	26.1			70	36.7	26.3	3.04	3.5
			85/71	62.7	43.6	70.2	2.26	27.7			80	36.6	24.3	3.37	3.2
60	6	1.1 (2.5)	75/63	50.0	39.2	58.8	2.69	18.6	40	1.2 (2.7)	60	39.5	30.3	2.79	4.2
			80/67	53.4	40.4	62.2	2.71	19.7			70	38.8	28.6	3.09	3.7
			85/71	56.9	41.4	65.9	2.74	20.8			80	39.0	26.6	3.42	3.3
	8	1.9 (4.3)	75/63	51.3	39.7	59.6	2.57	20.0		2.0 (4.6)	60	41.5	31.4	2.82	4.3
			80/67	54.8	40.8	63.3	2.59	21.2			70	40.3	30.0	3.12	3.8
			85/71	58.4	42.0	67.0	2.61	22.4			80	40.3	27.8	3.45	3.4
	12	3.8 (8.8)	75/63	52.6	40.3	60.6	2.45	21.5		4.1 (9.5)	60	42.9	33.3	2.86	4.4
			80/67	56.3	41.4	64.4	2.46	22.9			70	42.0	31.4	3.15	3.9
			85/71	59.9	42.7	68.1	2.47	24.2			80	41.1	29.4	3.48	3.5
70	6	1.1 (2.5)	75/63	47.7	38.2	57.1	2.93	16.3	50	1.1 (2.6)	60	44.9	35.0	2.90	4.5
			80/67	50.9	39.4	60.5	2.95	17.2			70	44.7	33.1	3.20	4.1
			85/71	54.3	40.4	64.0	2.98	18.2			80	44.0	31.3	3.52	3.7
	8	1.8 (4.1)	75/63	48.9	38.6	58.0	2.81	17.4		1.9 (4.4)	60	47.3	36.7	2.94	4.7
			80/67	52.2	39.9	61.5	2.83	18.5			70	46.4	34.7	3.23	4.2
			85/71	55.6	41.1	64.9	2.84	19.6			80	45.7	32.7	3.56	3.8
	12	3.7 (8.6)	75/63	50.1	39.1	58.9	2.68	18.7		4.0 (9.1)	60	49.0	39.0	2.98	4.8
			80/67	53.6	40.5	62.4	2.69	19.9			70	47.9	36.7	3.27	4.3
			85/71	57.2	41.7	66.1	2.70	21.2			80	47.5	34.3	3.60	3.9
80	6	1.0 (2.4)	75/63	45.2	37.1	55.5	3.20	14.1	60	1.1 (2.5)	60	50.6	40.4	3.01	4.9
			80/67	48.3	38.4	58.8	3.23	14.9			70	49.6	38.4	3.31	4.4
			85/71	51.6	39.5	62.2	3.26	15.8			80	48.8	36.4	3.64	3.9
	8	1.7 (4.0)	75/63	46.4	37.5	56.3	3.07	15.1		1.8 (4.3)	60	53.4	42.4	3.05	5.1
			80/67	49.6	38.8	59.7	3.09	16.0			70	52.3	40.2	3.35	4.6
			85/71	53.0	40.0	63.1	3.11	17.0			80	51.3	37.9	3.68	4.1
	12	3.6 (8.3)	75/63	47.5	38.1	57.0	2.94	16.1		3.8 (8.8)	60	55.4	45.0	3.09	5.2
			80/67	50.9	39.4	60.5	2.95	17.2			70	54.0	42.6	3.39	4.7
			85/71	54.4	40.6	64.1	2.96	18.4			80	52.8	40.1	3.73	4.1
85	6	1.0 (2.3)	75/63	44.0	36.5	54.8	3.35	13.1	70	1.1 (2.5)	60	56.5	46.0	3.11	5.3
			80/67	47.0	37.9	57.9	3.38	13.9			70	55.4	43.8	3.42	4.7
			85/71	50.2	39.0	61.3	3.42	14.7			80	54.5	41.6	3.77	4.2
	8	1.7 (3.9)	75/63	45.1	37.1	55.4	3.22	14.0		1.8 (4.1)	60	59.1	48.4	3.16	5.5
			80/67	48.2	38.4	58.7	3.24	14.9			70	57.8	46.0	3.47	4.9
			85/71	51.6	39.5	62.2	3.26	15.8			80	58.4	42.8	3.82	4.5
	12	3.5 (8.1)	75/63	46.3	37.5	56.3	3.09	15.0		3.7 (8.6)	60	62.1	51.4	3.21	5.7
			80/67	49.6	38.8	59.6	3.10	16.0			70	60.5	48.7	3.52	5.0
			85/71	53.0	40.0	63.2	3.11	17.0			80	59.1	46.0	3.88	4.5
90	6	1.0 (2.3)	75/63	42.7	36.1	54.0	3.52	12.1	80	1.0 (2.4)	60	62.6	52.1	3.22	5.7
			80/67	45.7	37.4	57.1	3.55	12.9			70	61.4	49.5	3.54	5.1
			85/71	48.8	38.5	60.4	3.59	13.6			80	60.2	47.0	3.90	4.5
	8	1.7 (3.9)	75/63	43.8	36.4	54.7	3.38	13.0		1.7 (4.0)	60	65.6	55.0	3.27	5.9
			80/67	46.8	37.9	57.8	3.40	13.8			70	64.1	52.0	3.59	5.2
			85/71	50.1	39.0	61.3	3.43	14.6			80	62.8	49.3	3.96	4.6
	12	3.5 (8.0)	75/63	44.9	37.0	55.3	3.24	13.9		3.6 (8.3)	60	69.0	58.0	3.33	6.1
			80/67	48.2	38.3	58.7	3.25	14.8			70	67.2	54.9	3.66	5.4
			85/71	51.6	39.5	62.2	3.27	15.8			80	65.8	51.4	4.03	4.8
100	6	1.0 (2.2)	75/63	40.2	35.1	52.7	3.88	10.4	Operation Not Recommended						
			80/67	43.1	36.3	55.7	3.92	11.0							
			85/71	45.9	37.7	58.7	3.96	11.6							
	8	1.6 (3.8)	75/63	41.2	35.5	53.2	3.73	11.0							
			80/67	44.2	36.7	56.3	3.76	11.8							
			85/71	47.2	38.0	59.5	3.79	12.5							
	12	3.4 (7.8)	75/63	42.2	35.9	53.7	3.59	11.8							
			80/67	45.3	37.3	56.9	3.60	12.6							
			85/71	48.6	38.4	60.3	3.62	13.4							
110	6	1.0 (2.2)	75/63	37.6	34.0	51.4	4.31	8.7							
			80/67	40.3	35.3	54.3	4.35	9.3							
			85/71	42.9	36.7	57.1	4.40	9.8							
	8	1.6 (3.6)	75/63	38.5	34.4	51.8	4.15	9.3							
			80/67	41.3	35.8	54.7	4.17	9.9							
			85/71	44.1	37.1	57.7	4.21	10.5							
	12	3.3 (7.6)	75/63	39.5	34.8	52.3	3.99	9.9							
			80/67	42.5	36.1	55.4	4.01	10.6							
			85/71	45.4	37.5	58.4	4.02	11.3							

Performance data (cont)

Carrier
United Technologies

50PTH,PTV060

1,600 CFM AT 0.60-in. ESP — PART LOAD

COOLING									HEATING						
Entering Fluid Temp (F)	Water Flow (GPM)	Pressure Drop PSI (FOH)	Entering Air Temp (db/wb) F	Total Capacity (MBtuh)	Sensible Capacity (MBtuh)	Heat of Rejection (MBtuh)	Power Input (kW)	EER	Entering Fluid Temp (F)	Pressure Drop PSI (FOH)	Entering Air Temp (F)	Total Capacity (MBtuh)	Heat of Absorption (MBtuh)	Power Input (kW)	COP
50	7.5	1.2 (2.8)	75/63	51.0	39.7	57.1	1.85	27.5	30	1.3 (3.0)	60	33.6	25.2	2.56	3.8
			80/67	54.5	40.9	60.5	1.83	29.8			70	32.4	22.8	2.85	3.3
			85/71	58.0	42.1	63.9	1.79	32.3			80	31.2	20.6	3.17	2.9
	10.0	2.0 (4.7)	75/63	52.1	40.2	57.9	1.77	29.4		2.2 (5.0)	60	34.5	26.0	2.57	3.9
			80/67	55.7	41.4	61.4	1.74	32.0			70	33.1	23.8	2.86	3.4
			85/71	59.3	42.5	64.9	1.70	34.8			80	31.9	21.4	3.18	2.9
	15.0	4.2 (9.7)	75/63	53.2	40.6	58.8	1.69	31.4		4.5 (10.4)	60	35.5	27.0	2.57	4.0
			80/67	56.8	41.9	62.3	1.65	34.3			70	34.4	24.3	2.87	3.5
			85/71	60.7	42.9	66.1	1.61	37.7			80	32.7	22.2	3.19	3.0
60	7.5	1.1 (2.6)	75/63	48.3	38.5	55.0	2.08	23.2	40	1.3 (2.9)	60	38.4	29.8	2.59	4.3
			80/67	51.7	39.7	58.4	2.05	25.2			70	37.1	27.5	2.89	3.8
			85/71	55.1	40.9	61.8	2.02	27.2			80	35.8	25.2	3.22	3.3
	10.0	1.9 (4.4)	75/63	49.3	38.9	55.8	2.00	24.7		2.1 (4.9)	60	39.5	31.0	2.60	4.5
			80/67	52.8	40.2	59.2	1.96	26.9			70	38.1	28.6	2.90	3.9
			85/71	56.2	41.4	62.6	1.93	29.2			80	36.7	26.2	3.23	3.3
	15.0	3.9 (9.1)	75/63	50.4	39.3	56.6	1.91	26.4		4.4 (10.9)	60	40.8	32.2	2.61	4.6
			80/67	53.8	40.7	60.0	1.87	28.8			70	39.2	29.6	2.91	4.0
			85/71	57.6	41.8	63.7	1.83	31.5			80	38.0	27.0	3.24	3.4
70	7.5	1.1 (2.6)	75/63	45.5	37.3	53.1	2.34	19.4	50	1.2 (2.8)	60	43.6	34.9	2.62	4.9
			80/67	48.6	38.7	56.2	2.31	21.0			70	42.2	32.4	2.93	4.2
			85/71	52.1	39.8	59.5	2.29	22.8			80	41.0	29.9	3.26	3.7
	10.0	1.9 (4.4)	75/63	46.4	37.8	53.7	2.25	20.6		2.0 (4.7)	60	45.0	36.3	2.63	5.0
			80/67	49.8	39.0	57.0	2.22	22.4			70	43.5	33.6	2.93	4.3
			85/71	53.2	40.2	60.4	2.18	24.4			80	42.0	31.3	3.27	3.8
	15.0	3.9 (9.1)	75/63	47.4	38.2	54.4	2.16	21.9		4.2 (9.7)	60	46.5	38.0	2.63	5.2
			80/67	50.8	39.5	57.7	2.12	23.9			70	45.4	34.8	2.94	4.5
			85/71	54.3	40.8	61.2	2.08	26.1			80	43.4	32.1	3.28	3.9
80	7.5	1.1 (2.5)	75/63	42.6	36.1	51.1	2.64	16.1	60	1.2 (2.7)	60	49.1	40.4	2.64	5.5
			80/67	45.7	37.5	54.2	2.61	17.5			70	47.6	37.8	2.96	4.7
			85/71	48.9	38.8	57.2	2.58	18.9			80	46.3	35.0	3.30	4.1
	10.0	1.8 (4.2)	75/63	43.5	36.4	51.7	2.55	17.1		2.0 (4.5)	60	51.2	41.8	2.64	5.7
			80/67	46.7	37.8	54.8	2.51	18.6			70	49.6	39.0	2.96	4.9
			85/71	49.9	39.2	58.0	2.47	20.2			80	47.7	36.3	3.31	4.2
	15.0	3.8 (8.8)	75/63	44.3	36.9	52.2	2.45	18.1		4.1 (9.4)	60	52.6	44.1	2.65	5.8
			80/67	47.7	38.3	55.5	2.41	19.8			70	51.3	40.6	2.97	5.1
			85/71	51.2	39.5	58.9	2.37	21.6			80	49.1	38.4	3.32	4.3
85	7.5	1.1 (2.5)	75/63	41.1	35.6	50.1	2.80	14.7	70	1.1 (2.6)	60	55.4	45.9	2.65	6.1
			80/67	44.2	36.9	53.2	2.77	15.9			70	53.8	43.1	2.98	5.3
			85/71	47.4	38.2	56.3	2.75	17.3			80	51.7	40.7	3.34	4.5
	10.0	1.8 (4.2)	75/63	42.0	35.9	50.6	2.71	15.5		1.9 (4.4)	60	57.3	47.8	2.66	6.3
			80/67	45.2	37.2	53.8	2.67	16.9			70	55.5	44.9	2.99	5.5
			85/71	48.4	38.5	57.0	2.64	18.3			80	53.5	41.8	3.35	4.7
	15.0	3.7 (8.5)	75/63	42.9	36.2	51.3	2.61	16.4		3.9 (9.1)	60	59.5	49.9	2.66	6.6
			80/67	46.1	37.6	54.4	2.57	17.9			70	57.5	46.7	2.99	5.6
			85/71	49.5	38.9	57.7	2.53	19.6			80	55.7	43.5	3.36	4.9
90	7.5	1.0 (2.4)	75/63	39.7	35.0	49.2	2.97	13.4	80	1.1 (2.5)	60	61.3	51.9	2.66	6.8
			80/67	42.7	36.3	52.2	2.94	14.5			70	59.6	48.9	3.00	5.8
			85/71	45.8	37.6	55.2	2.92	15.7			80	57.4	46.2	3.37	5.0
	10.0	1.8 (4.1)	75/63	40.5	35.2	49.7	2.88	14.1		1.8 (4.2)	60	63.6	54.1	2.66	7.0
			80/67	43.6	36.7	52.7	2.84	15.3			70	61.1	51.3	3.00	6.0
			85/71	46.8	38.1	55.8	2.81	16.7			80	59.4	47.6	3.38	5.2
	15.0	3.7 (8.5)	75/63	41.4	35.5	50.3	2.78	14.9		3.8 (8.8)	60	66.0	56.5	2.66	7.3
			80/67	44.5	37.0	53.4	2.74	16.2			70	63.8	53.0	3.01	6.2
			85/71	47.8	38.5	56.5	2.70	17.7			80	61.8	49.6	3.38	5.4
100	7.5	1.0 (2.4)	75/63	36.9	33.8	47.5	3.32	11.1	Operation Not Recommended						
			80/67	39.7	35.3	50.3	3.30	12.0							
			85/71	42.6	36.6	53.2	3.29	13.0							
	10.0	1.7 (4.0)	75/63	37.6	34.1	47.9	3.23	11.6							
			80/67	40.5	35.6	50.7	3.21	12.6							
			85/71	43.4	37.0	53.7	3.18	13.6							
	15.0	3.6 (8.3)	75/63	38.4	34.3	48.4	3.14	12.2							
			80/67	41.3	35.9	51.2	3.11	13.3							
			85/71	44.5	37.2	54.4	3.07	14.5							
110	7.5	1.0 (2.3)	75/63	34.0	32.7	45.8	3.72	9.1							
			80/67	36.6	34.2	48.5	3.71	9.9							
			85/71	39.4	35.7	51.3	3.68	10.7							
	10.0	1.7 (3.9)	75/63	34.6	33.0	46.1	3.63	9.5							
			80/67	37.4	34.5	48.9	3.60	10.4							
			85/71	40.3	35.9	51.8	3.58	11.3							
	15.0	3.5 (8.0)	75/63	35.3	33.2	46.5	3.54	10.0							
			80/67	38.2	34.6	49.4	3.50	10.9							
			85/71	41.1	36.2	52.2	3.47	11.8							

50PTH,PTV060

2,000 CFM AT 0.60-in. ESP — FULL LOAD

COOLING									HEATING						
Entering Fluid Temp (F)	Water Flow (GPM)	Pressure Drop PSI (FOH)	Entering Air Temp (db/wb) F	Total Capacity (MBtuh)	Sensible Capacity (MBtuh)	Heat of Rejection (MBtuh)	Power Input (kW)	EER	Entering Fluid Temp (F)	Pressure Drop PSI (FOH)	Entering Air Temp (F)	Total Capacity (MBtuh)	Heat of Absorption (MBtuh)	Power Input (kW)	COP
50	7.5	1.2 (2.8)	75/63	66.6	50.5	77.1	3.15	21.1	30	1.3 (3.0)	60	46.3	33.6	3.51	3.9
			80/67	71.0	52.0	81.7	3.21	22.1			70	45.8	31.6	3.87	3.5
			85/71	75.5	53.4	86.4	3.27	23.1			80	45.2	29.7	4.25	3.1
	10.0	2.0 (4.7)	75/63	68.0	51.1	78.1	3.04	22.4		2.2 (5.0)	60	47.3	35.4	3.54	3.9
			80/67	72.5	52.7	82.8	3.09	23.4			70	47.2	32.8	3.90	3.6
			85/71	77.3	54.1	87.8	3.15	24.5			80	45.8	31.2	4.28	3.1
	15.0	4.2 (9.7)	75/63	69.5	51.8	79.2	2.93	23.7		4.5 (10.4)	60	49.1	36.7	3.57	4.0
			80/67	74.1	53.3	84.1	2.98	24.9			70	48.0	34.8	3.93	3.6
			85/71	79.2	54.6	89.4	3.04	26.1			80	48.0	31.9	4.31	3.3
60	7.5	1.1 (2.6)	75/63	63.9	49.4	75.1	3.40	18.8	40	1.3 (2.9)	60	52.6	39.2	3.63	4.2
			80/67	68.1	51.0	79.4	3.45	19.8			70	52.9	36.5	3.99	3.9
			85/71	72.4	52.3	84.0	3.50	20.7			80	52.2	34.5	4.38	3.5
	10.0	1.9 (4.4)	75/63	65.3	50.0	76.1	3.27	19.9		2.1 (4.9)	60	54.5	40.9	3.67	4.4
			80/67	69.6	51.6	80.6	3.32	21.0			70	53.6	38.7	4.02	3.9
			85/71	74.3	52.8	85.5	3.37	22.0			80	52.8	36.5	4.42	3.5
	15.0	3.9 (9.1)	75/63	66.6	50.6	77.0	3.15	21.1		4.4 (10.9)	60	56.0	43.2	3.71	4.4
			80/67	71.3	52.0	81.9	3.20	22.3			70	54.8	40.8	4.06	4.0
			85/71	76.0	53.5	86.8	3.24	23.4			80	54.6	38.0	4.46	3.6
70	7.5	1.1 (2.6)	75/63	61.0	48.2	73.0	3.67	16.6	50	1.2 (2.8)	60	58.8	45.8	3.76	4.6
			80/67	65.1	49.8	77.3	3.72	17.5			70	57.8	43.5	4.12	4.1
			85/71	69.3	51.2	81.7	3.78	18.4			80	56.9	41.2	4.52	3.7
	10.0	1.9 (4.4)	75/63	62.3	48.8	73.9	3.54	17.6		2.0 (4.7)	60	61.0	48.5	3.81	4.7
			80/67	66.6	50.4	78.4	3.58	18.6			70	60.6	45.2	4.17	4.3
			85/71	71.1	51.6	83.1	3.63	19.6			80	59.6	42.7	4.57	3.8
	15.0	3.9 (9.1)	75/63	63.7	49.2	75.0	3.42	18.6		4.2 (9.7)	60	63.6	50.5	3.86	4.8
			80/67	68.1	50.8	79.5	3.45	19.7			70	63.1	47.2	4.22	4.4
			85/71	72.6	52.4	84.2	3.49	20.8			80	61.8	44.5	4.62	3.9
80	7.5	1.1 (2.5)	75/63	58.1	47.0	71.1	4.00	14.5	60	1.2 (2.7)	60	67.6	51.7	3.90	5.1
			80/67	62.1	48.4	75.4	4.05	15.3			70	66.5	49.2	4.27	4.6
			85/71	66.0	50.0	79.5	4.10	16.1			80	63.7	48.1	4.69	4.0
	10.0	1.8 (4.2)	75/63	59.3	47.5	71.9	3.86	15.4		2.0 (4.5)	60	69.4	54.8	3.96	5.1
			80/67	63.4	49.1	76.2	3.89	16.3			70	68.0	52.1	4.33	4.6
			85/71	67.6	50.6	80.6	3.93	17.2			80	68.0	48.2	4.74	4.2
	15.0	3.8 (8.8)	75/63	60.7	47.9	72.9	3.72	16.3		4.1 (9.4)	60	71.8	58.1	4.02	5.2
			80/67	64.9	49.5	77.3	3.75	17.3			70	70.1	55.1	4.39	4.7
			85/71	69.3	51.0	81.8	3.78	18.3			80	69.5	51.5	4.80	4.2
85	7.5	1.1 (2.5)	75/63	56.6	46.4	70.2	4.18	13.5	70	1.1 (2.6)	60	74.2	59.4	4.06	5.4
			80/67	60.5	47.8	74.4	4.23	14.3			70	72.8	56.6	4.43	4.8
			85/71	64.4	49.4	78.4	4.27	15.1			80	71.6	53.8	4.85	4.3
	10.0	1.8 (4.2)	75/63	57.9	46.8	71.1	4.04	14.3		1.9 (4.4)	60	77.5	62.3	4.12	5.5
			80/67	61.8	48.5	75.1	4.07	15.2			70	77.0	58.1	4.50	5.0
			85/71	66.0	49.8	79.6	4.11	16.1			80	75.6	55.0	4.92	4.5
	15.0	3.7 (8.5)	75/63	59.0	47.4	71.7	3.89	15.1		3.9 (9.1)	60	80.4	66.2	4.20	5.6
			80/67	63.1	49.0	76.0	3.92	16.1			70	78.4	62.7	4.58	5.0
			85/71	67.6	50.4	80.6	3.95	17.1			80	76.8	59.4	5.00	4.5
90	7.5	1.0 (2.4)	75/63	55.1	45.7	69.3	4.37	12.6	80	1.1 (2.5)	60	82.1	66.8	4.22	5.7
			80/67	58.9	47.4	73.3	4.42	13.3			70	80.5	63.7	4.61	5.1
			85/71	62.7	48.8	77.3	4.47	14.0			80	79.0	60.5	5.04	4.6
	10.0	1.8 (4.1)	75/63	56.3	46.1	70.1	4.23	13.3		1.8 (4.2)	60	85.9	70.1	4.31	5.8
			80/67	60.1	47.9	74.1	4.26	14.1			70	84.0	66.7	4.69	5.3
			85/71	64.3	49.2	78.4	4.30	15.0			80	82.2	63.3	5.12	4.7
	15.0	3.7 (8.5)	75/63	57.4	46.7	70.7	4.08	14.1		3.8 (8.8)	60	89.3	74.5	4.40	5.9
			80/67	61.5	48.4	74.9	4.10	15.0			70	87.1	71.6	4.79	5.3
			85/71	65.7	49.9	79.3	4.13	15.9			80	85.7	66.2	5.22	4.8
100	7.5	1.0 (2.4)	75/63	52.0	44.5	67.6	4.80	10.8	Operation Not Recommended						
			80/67	55.6	46.1	71.4	4.85	11.5							
			85/71	59.2	47.6	75.2	4.89	12.1							
	10.0	1.7 (4.0)	75/63	53.1	44.9	68.2	4.65	11.4							
			80/67	56.8	46.6	72.1	4.68	12.1							
			85/71	60.7	48.0	76.2	4.72	12.9							
	15.0	3.6 (8.3)	75/63	54.2	45.4	68.8	4.50	12.0							
			80/67	58.0	47.1	72.8	4.52	12.8							
			85/71	62.2	48.4	77.1	4.55	13.7							
110	7.5	1.0 (2.3)	75/63	48.9	43.2	66.1	5.30	9.2							
			80/67	52.2	44.9	69.6	5.34	9.8							
			85/71	55.6	46.4	73.2	5.39	10.3							
	10.0	1.7 (3.9)	75/63	49.9	43.6	66.5	5.13	9.7							
			80/67	53.4	45.3	70.2	5.17	10.3							
			85/71	57.0	46.9	74.0	5.20	11.0							
	15.0	3.5 (8.0)	75/63	50.9	43.8	67.2	4.99	10.2							
			80/67	54.5	45.7	70.8	5.00	10.9							
			85/71	58.3	47.3	74.7	5.02	11.6							

Performance data (cont)

Carrier
United Technologies

50PTH,PTV070

1,850 CFM AT 0.60-in. ESP — PART LOAD

COOLING									HEATING						
Entering Fluid Temp (F)	Water Flow (GPM)	Pressure Drop PSI (FOH)	Entering Air Temp (db/wb) F	Total Capacity (MBtuh)	Sensible Capacity (MBtuh)	Heat of Rejection (MBtuh)	Power Input (kW)	EER	Entering Fluid Temp (F)	Pressure Drop PSI (FOH)	Entering Air Temp (F)	Total Capacity (MBtuh)	Heat of Absorption (MBtuh)	Power Input (kW)	COP
50	9	0.9 (2.1)	75/63	58.8	45.7	66.3	2.28	25.7	30	1.0 (2.3)	60	39.9	29.3	3.05	3.8
			80/67	62.6	47.1	70.1	2.27	27.5			70	39.5	26.9	3.39	3.4
			85/71	66.6	48.4	74.1	2.27	29.4			80	38.8	25.8	3.78	3.0
	12	1.5 (3.5)	75/63	59.9	46.2	67.1	2.18	27.5		1.6 (3.8)	60	41.5	25.9	3.05	4.0
			80/67	63.9	47.7	71.0	2.16	29.5			70	40.3	29.6	3.40	3.5
			85/71	68.2	48.8	75.3	2.15	31.8			80	39.3	23.9	3.78	3.0
	18	3.2 (7.3)	75/63	61.1	46.7	68.0	2.07	29.4		3.4 (7.9)	60	41.7	33.0	3.07	4.0
			80/67	65.3	48.1	72.1	2.05	31.9			70	41.1	29.1	3.41	3.5
			85/71	69.6	49.4	76.4	2.02	34.4			80	40.0	27.3	3.80	3.1
60	9	0.9 (2.0)	75/63	56.0	44.6	64.3	2.54	22.0	40	0.9 (2.2)	60	45.1	35.0	3.09	4.3
			80/67	59.7	46.0	68.1	2.54	23.5			70	45.4	23.5	3.41	3.9
			85/71	63.6	47.4	72.0	2.54	25.0			80	41.0	36.0	3.82	3.1
	12	1.5 (3.4)	75/63	57.1	45.0	65.1	2.43	23.4		1.6 (3.7)	60	46.8	36.0	3.10	4.4
			80/67	61.1	46.4	69.0	2.42	25.2			70	46.3	27.9	3.44	4.0
			85/71	65.1	47.7	73.1	2.41	27.0			80	45.2	29.5	3.84	3.5
	18	3.1 (7.1)	75/63	58.3	45.5	65.9	2.33	25.1		3.3 (7.6)	60	49.2	32.8	3.11	4.6
			80/67	62.3	47.0	69.9	2.30	27.0			70	46.4	35.5	3.46	3.9
			85/71	66.4	48.4	74.0	2.28	29.1			80	46.3	32.4	3.85	3.5
70	9	0.9 (2.0)	75/63	53.2	43.4	62.4	2.84	18.7	50	0.9 (2.1)	60	51.3	41.1	3.13	4.8
			80/67	56.8	44.9	66.1	2.84	20.0			70	50.1	38.8	3.49	4.2
			85/71	60.7	46.1	70.0	2.85	21.3			80	50.1	36.3	3.89	3.8
	12	1.4 (3.3)	75/63	54.3	43.7	63.2	2.73	19.9		1.5 (3.5)	60	53.3	42.5	3.14	5.0
			80/67	58.1	45.2	67.0	2.72	21.3			70	53.6	29.9	3.48	4.5
			85/71	62.0	46.6	70.9	2.71	22.8			80	52.0	29.2	3.88	3.9
	18	3.0 (6.9)	75/63	55.4	44.2	63.9	2.61	21.2		3.2 (7.3)	60	56.6	36.6	3.14	5.3
			80/67	59.2	45.8	67.7	2.60	22.8			70	54.9	35.8	3.51	4.6
			85/71	63.2	47.2	71.7	2.58	24.5			80	51.4	40.1	3.92	3.8
80	9	0.8 (1.9)	75/63	50.4	42.1	60.7	3.18	15.8	60	0.9 (2.0)	60	58.2	47.3	3.17	5.4
			80/67	53.8	43.7	64.1	3.18	16.9			70	56.8	44.6	3.54	4.7
			85/71	57.4	45.1	67.8	3.19	18.0			80	55.8	41.9	3.95	4.1
	12	1.4 (3.2)	75/63	51.3	42.6	61.2	3.06	16.8		1.5 (3.4)	60	60.4	49.3	3.19	5.6
			80/67	54.9	44.2	64.8	3.06	18.0			70	59.1	46.8	3.56	4.9
			85/71	58.6	45.6	68.6	3.05	19.2			80	53.4	55.4	3.97	3.9
	18	2.9 (6.6)	75/63	52.4	43.0	61.9	2.94	17.8		3.1 (7.1)	60	64.5	36.4	3.17	6.0
			80/67	56.1	44.5	65.7	2.93	19.2			70	62.5	39.4	3.56	5.1
			85/71	59.9	46.0	69.4	2.91	20.6			80	59.8	40.5	3.98	4.4
85	9	0.8 (1.9)	75/63	48.9	41.5	59.8	3.37	14.5	70	0.9 (2.0)	60	65.2	54.3	3.22	5.9
			80/67	52.2	43.1	63.2	3.37	15.5			70	63.7	51.4	3.61	5.2
			85/71	55.9	44.4	66.9	3.38	16.5			80	63.7	49.9	4.05	4.6
	12	1.3 (3.1)	75/63	49.9	41.9	60.3	3.24	15.4		1.4 (3.3)	60	67.6	57.3	3.24	6.1
			80/67	53.3	43.6	63.8	3.24	16.4			70	66.5	53.6	3.63	5.4
			85/71	57.1	44.9	67.6	3.24	17.6			80	65.9	51.7	4.07	4.7
	18	2.8 (6.5)	75/63	50.8	42.4	60.9	3.12	16.3		3.0 (6.9)	60	73.6	39.7	3.21	6.7
			80/67	54.5	43.9	64.6	3.11	17.5			70	70.6	41.8	3.62	5.7
			85/71	58.2	45.4	68.3	3.10	18.8			80	64.7	64.5	4.09	4.6
90	9	0.8 (1.8)	75/63	47.5	40.9	58.9	3.56	13.3	80	0.8 (1.9)	60	72.6	61.5	3.27	6.5
			80/67	50.7	42.6	62.2	3.57	14.2			70	70.9	58.1	3.67	5.7
			85/71	54.2	44.0	65.8	3.58	15.1			80	69.3	55.1	4.11	4.9
	12	1.3 (3.1)	75/63	48.3	41.4	59.4	3.44	14.0		1.4 (3.2)	60	75.6	64.2	3.29	6.7
			80/67	51.8	42.8	62.9	3.44	15.1			70	73.7	60.7	3.70	5.8
			85/71	55.4	44.3	66.6	3.44	16.1			80	60.8	93.6	4.14	4.3
	18	2.8 (6.4)	75/63	49.3	41.7	60.0	3.31	14.9		2.9 (6.6)	60	79.3	67.6	3.32	7.0
			80/67	52.9	43.3	63.6	3.30	16.0			70	77.5	63.6	3.73	6.1
			85/71	56.5	44.8	67.2	3.29	17.2			80	77.0	40.6	4.11	5.5
100	9	0.8 (1.8)	75/63	44.4	39.7	57.3	3.99	11.1	Operation Not Recommended						
			80/67	47.6	41.4	60.5	4.00	11.9							
			85/71	51.0	43.0	63.9	3.99	12.8							
	12	1.3 (3.0)	75/63	45.3	40.1	57.7	3.87	11.7							
			80/67	48.6	41.6	61.1	3.87	12.6							
			85/71	52.0	43.3	64.5	3.85	13.5							
	18	2.7 (6.2)	75/63	46.1	40.5	58.1	3.74	12.3							
			80/67	49.5	42.1	61.5	3.73	13.3							
			85/71	53.1	43.7	65.1	3.71	14.3							
110	9	0.7 (1.7)	75/63	41.2	38.6	55.6	4.47	9.2							
			80/67	44.5	40.3	58.9	4.46	10.0							
			85/71	47.7	41.9	62.1	4.45	10.7							
	12	1.3 (2.9)	75/63	42.2	38.8	56.2	4.35	9.7							
			80/67	45.4	40.6	59.4	4.33	10.5							
			85/71	48.8	42.2	62.7	4.31	11.3							
	18	2.6 (6.1)	75/63	42.9	39.2	56.5	4.22	10.2							
			80/67	46.2	40.9	59.8	4.19	11.0							
			85/71	49.8	42.5	63.3	4.17	11.9							

50PTH,PTV070

2,350 CFM AT 0.60-in. ESP — FULL LOAD

COOLING									HEATING						
Entering Fluid Temp (F)	Water Flow (GPM)	Pressure Drop PSI (FOH)	Entering Air Temp (db/wb) F	Total Capacity (MBtuh)	Sensible Capacity (MBtuh)	Heat of Rejection (MBtuh)	Power Input (kW)	EER	Entering Fluid Temp (F)	Pressure Drop PSI (FOH)	Entering Air Temp (F)	Total Capacity (MBtuh)	Heat of Absorption (MBtuh)	Power Input (kW)	COP
50	9	0.9 (2.1)	75/63	74.5	56.1	86.7	3.68	20.2	30	1.0 (2.3)	60	52.5	38.1	4.16	3.7
			80/67	79.5	58.0	91.9	3.73	21.3			70	51.6	35.9	4.56	3.3
			85/71	84.7	59.6	97.3	3.79	22.4			80	51.9	33.7	4.99	3.0
	12	1.5 (3.5)	75/63	76.2	56.8	87.9	3.53	21.6		1.6 (3.8)	60	54.0	39.4	4.20	3.8
			80/67	81.5	58.4	93.4	3.57	22.8			70	54.0	37.3	4.59	3.4
			85/71	86.8	60.4	98.9	3.62	24.0			80	52.9	34.2	5.02	3.1
	18	3.2 (7.3)	75/63	78.0	57.6	89.2	3.37	23.1		3.4 (7.9)	60	55.8	41.6	4.23	3.9
			80/67	83.5	59.2	94.9	3.41	24.5			70	55.3	38.1	4.63	3.5
			85/71	89.2	60.9	100.8	3.45	25.9			80	54.4	37.2	5.07	3.1
60	9	0.9 (2.0)	75/63	71.4	54.9	84.5	3.98	18.0	40	0.9 (2.2)	60	59.7	44.6	4.29	4.1
			80/67	76.4	56.4	89.7	4.03	19.0			70	59.0	42.5	4.70	3.7
			85/71	81.5	58.0	95.0	4.07	20.0			80	57.8	40.1	5.14	3.3
	12	1.5 (3.4)	75/63	73.0	55.6	85.6	3.82	19.1		1.6 (3.7)	60	61.6	46.5	4.33	4.2
			80/67	78.1	57.4	90.8	3.86	20.2			70	60.7	44.3	4.74	3.8
			85/71	83.3	59.1	96.3	3.90	21.4			80	59.8	42.1	5.19	3.4
	18	3.1 (7.1)	75/63	74.8	56.0	86.9	3.67	20.4		3.3 (7.6)	60	64.2	49.1	4.38	4.3
			80/67	80.1	57.8	92.4	3.69	21.7			70	63.0	47.1	4.79	3.9
			85/71	85.6	59.5	98.1	3.73	23.0			80	61.5	43.6	5.23	3.4
70	9	0.9 (2.0)	75/63	68.3	53.3	82.5	4.31	15.9	50	0.9 (2.1)	60	67.2	52.0	4.43	4.4
			80/67	72.9	55.4	87.2	4.34	16.8			70	66.4	49.8	4.85	4.0
			85/71	77.8	57.1	92.3	4.39	17.7			80	65.8	47.6	5.31	3.6
	12	1.4 (3.3)	75/63	69.7	54.2	83.4	4.14	16.8		1.5 (3.5)	60	70.4	54.6	4.48	4.6
			80/67	74.8	55.7	88.6	4.18	17.9			70	68.2	51.4	4.89	4.1
			85/71	79.9	57.4	93.8	4.21	19.0			80	68.9	48.7	5.36	3.8
	18	3.0 (6.9)	75/63	71.4	54.9	84.5	3.98	17.9		3.2 (7.3)	60	73.2	57.9	4.54	4.7
			80/67	76.4	56.8	89.7	4.00	19.1			70	72.6	54.0	4.96	4.3
			85/71	81.9	58.1	95.3	4.03	20.3			80	70.3	51.9	5.42	3.8
80	9	0.8 (1.9)	75/63	65.0	52.3	80.3	4.66	13.9	60	0.9 (2.0)	60	75.6	59.6	4.58	4.8
			80/67	69.6	53.7	85.0	4.71	14.8			70	74.5	57.0	5.01	4.4
			85/71	73.9	56.4	89.5	4.75	15.6			80	73.6	54.4	5.49	3.9
	12	1.4 (3.2)	75/63	66.5	52.5	81.3	4.51	14.8		1.5 (3.4)	60	79.3	63.0	4.65	5.0
			80/67	71.2	54.4	86.1	4.54	15.7			70	77.9	60.0	5.08	4.5
			85/71	76.1	56.0	91.2	4.57	16.7			80	76.0	56.7	5.55	4.0
	18	2.9 (6.6)	75/63	67.9	53.4	82.1	4.34	15.7		3.1 (7.1)	60	82.7	66.8	4.73	5.1
			80/67	72.9	55.0	87.3	4.36	16.7			70	78.9	61.3	5.12	4.5
			85/71	77.9	57.2	92.4	4.38	17.8			80	79.4	60.0	5.62	4.1
85	9	0.8 (1.9)	75/63	63.5	51.3	79.4	4.86	13.1	70	0.9 (2.0)	60	84.6	68.0	4.75	5.2
			80/67	67.7	53.4	83.8	4.90	13.8			70	82.6	64.6	5.18	4.7
			85/71	72.2	55.2	88.5	4.95	14.6			80	81.8	61.7	5.67	4.2
	12	1.3 (3.1)	75/63	64.9	51.9	80.3	4.69	13.8		1.4 (3.3)	60	88.5	72.1	4.84	5.4
			80/67	69.4	53.6	85.0	4.73	14.7			70	86.9	69.1	5.27	4.8
			85/71	74.2	55.4	89.9	4.76	15.6			80	85.4	65.1	5.75	4.4
	18	2.8 (6.5)	75/63	66.2	52.7	81.0	4.53	14.6		3.0 (6.9)	60	93.3	76.1	4.93	5.6
			80/67	71.1	54.3	86.0	4.55	15.6			70	91.2	72.3	5.36	5.0
			85/71	75.9	56.4	91.0	4.57	16.6			80	89.3	68.4	5.84	4.5
90	9	0.8 (1.8)	75/63	61.8	50.9	78.3	5.06	12.2	80	0.8 (1.9)	60	93.8	76.6	4.94	5.6
			80/67	65.9	53.1	82.6	5.10	12.9			70	92.1	73.3	5.38	5.0
			85/71	70.4	54.4	87.4	5.16	13.6			80	90.6	69.9	5.87	4.5
	12	1.3 (3.1)	75/63	63.3	51.1	79.3	4.90	12.9		1.4 (3.2)	60	98.4	80.9	5.03	5.7
			80/67	67.3	53.9	83.5	4.92	13.7			70	96.4	77.2	5.47	5.2
			85/71	72.1	55.1	88.4	4.97	14.5			80	94.5	73.9	5.96	4.6
	18	2.8 (6.4)	75/63	64.5	52.0	79.9	4.73	13.6		2.9 (6.6)	60	103.7	85.8	5.14	5.9
			80/67	69.0	53.9	84.7	4.75	14.5			70	101.4	81.8	5.57	5.3
			85/71	74.1	55.3	89.8	4.78	15.5			80	99.1	77.2	6.06	4.8
100	9	0.8 (1.8)	75/63	58.2	50.1	76.2	5.51	10.6	Operation Not Recommended						
			80/67	62.6	51.3	80.8	5.56	11.2							
			85/71	66.6	53.3	85.0	5.61	11.9							
	12	1.3 (3.0)	75/63	59.5	50.5	76.9	5.33	11.2							
			80/67	63.9	52.0	81.5	5.37	11.9							
			85/71	68.2	54.0	85.9	5.41	12.6							
	18	2.7 (6.2)	75/63	61.0	50.6	77.9	5.17	11.8							
			80/67	65.3	52.5	82.4	5.19	12.6							
			85/71	69.9	54.3	87.0	5.21	13.4							
110	9	0.7 (1.7)	75/63	54.9	48.3	74.7	6.05	9.1							
			80/67	58.7	50.1	78.7	6.10	9.6							
			85/71	62.6	52.1	82.7	6.14	10.2							
	12	1.3 (2.9)	75/63	56.0	49.0	75.1	5.86	9.5							
			80/67	60.1	50.6	79.4	5.89	10.2							
			85/71	64.3	52.3	83.7	5.93	10.8							
	18	2.6 (6.1)	75/63	57.4	49.0	75.9	5.68	10.1							
			80/67	61.5	51.1	80.1	5.70	10.8							
			85/71	65.9	52.7	84.7	5.72	11.5							

Performance data (cont)

ANTIFREEZE CORRECTION TABLE

ANTIFREEZE TYPE	ANTIFREEZE %	COOLING			HEATING		WPD CORRECTION FACTOR
		EWT 90 F			EWT 30 F		
		Total Capacity	Sensible Capacity	kW	Heating Capacity	kW	EWT 30 F
Propylene Glycol	0	1.000	1.000	1.000	1.000	1.000	1.000
	5	0.997	0.997	1.004	0.989	0.997	1.060
	10	0.994	0.994	1.006	0.986	0.995	1.125
	15	0.990	0.990	1.009	0.978	0.988	1.190
	25	0.983	0.983	1.016	0.960	0.979	1.300
Methanol	5	0.997	0.997	1.003	0.990	0.997	1.060
	10	0.996	0.996	1.005	0.979	0.993	1.100
	15	0.994	0.994	1.008	0.970	0.990	1.140
Ethanol	5	0.998	0.998	1.002	0.981	0.994	1.160
	10	0.996	0.996	1.004	0.960	0.988	1.230
	15	0.992	0.992	1.006	0.944	0.983	1.280
	25	0.986	0.986	1.009	0.917	0.974	1.400
Ethylene Glycol	5	0.997	0.997	1.003	0.993	0.998	1.060
	10	0.995	0.995	1.004	0.986	0.996	1.120
	15	0.992	0.992	1.005	0.980	0.993	1.190
	25	0.988	0.988	1.009	0.970	0.990	1.330
	30	0.985	0.985	1.012	0.965	0.987	1.400

LEGEND

EWT — Entering Water Temperature
WPD — Water Pressure Differential

CONSTANT TORQUE MOTOR BLOWER PERFORMANCE DATA

50PTH, PTV UNITS	FAN SPEED	RATED AIRFLOW (Cfm)	FACTORY SETTING	AIRFLOW (Cfm) External Static Pressure (in. wg)											
				0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20
024	5	950		1,154	1,117	1,077	1,034	988	938	886	830	—	—	—	—
	4	825	FL	1,072	1,018	966	915	866	818	772	727	—	—	—	—
	3	725		976	920	867	815	766	719	674	631	—	—	—	—
	2	650	PL/Fan Only	906	844	785	730	678	630	585	544	—	—	—	—
	1	500		829	750	676	610	551	498	451	412	—	—	—	—
036	5	1300		1,506	1,469	1,430	1,390	1,347	1,300	1,249	1,193	1,130	1,061	—	—
	4	1100	FL	1,425	1,326	1,250	1,191	1,143	1,100	1,056	1,006	942	860	—	—
	3	950		1,354	1,233	1,138	1,063	1,002	950	901	850	791	719	—	—
	2	800	PL/Fan Only	1,294	1,157	1,041	946	866	800	744	696	653	611	—	—
	1	750		1,213	1,084	976	886	812	750	698	653	612	573	—	—
048	5	1800		1,950	1,912	1,880	1,852	1,826	1,800	1,771	1,737	1,695	1,644	—	—
	4	1600	FL	1,774	1,738	1,703	1,669	1,635	1,600	1,562	1,521	1,475	1,423	—	—
	3	1400		1,565	1,526	1,493	1,463	1,432	1,400	1,363	1,319	1,265	1,199	—	—
	2	1300	PL/Fan Only	1,506	1,469	1,430	1,390	1,347	1,300	1,249	1,193	1,130	1,061	—	—
	1	1100		1,425	1,326	1,250	1,191	1,143	1,100	1,056	1,006	942	860	—	—
060	5	2200		2,476	2,403	2,338	2,283	2,237	2,200	2,172	2,153	2,142	2,141	2,149	2,166
	4	2000	FL	2,170	2,135	2,100	2,066	2,033	2,000	1,968	1,937	1,907	1,877	1,848	1,819
	3	1800		1,942	1,914	1,886	1,858	1,829	1,800	1,770	1,741	1,710	1,680	1,649	1,617
	2	1600	PL/Fan Only	1,766	1,729	1,693	1,660	1,629	1,600	1,573	1,548	1,526	1,505	1,487	1,470
	1	1400		1,561	1,520	1,483	1,451	1,423	1,400	1,381	1,366	1,356	1,350	1,349	1,352
070	5	2500		2,723	2,671	2,622	2,578	2,537	2,500	2,467	2,437	2,412	2,390	2,372	2,358
	4	2350	FL	2,566	2,529	2,489	2,446	2,399	2,350	2,298	2,242	2,184	2,122	2,057	1,990
	3	2100		2,256	2,230	2,202	2,171	2,137	2,100	2,060	2,017	1,971	1,922	1,871	1,816
	2	1850	PL/Fan Only	2,004	1,975	1,945	1,915	1,883	1,850	1,816	1,781	1,745	1,708	1,669	1,630
	1	1600		1,766	1,728	1,693	1,660	1,629	1,600	1,573	1,548	1,526	1,505	1,486	1,470

LEGEND

— — Operation Not Recommended

ECM CONSTANT CFM MOTOR BLOWER PERFORMANCE DATA

50PTH, PTV UNITS	FAN SPEED	RATED AIRFLOW (Cfm)	ADJUSTMENT	TAP	AIRFLOW (Cfm) External Static Pressure (in. wg)									
					0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00
024 PART LOAD	High	725	+	A	725	725	725	725	725	725	725	725	—	—
	Med	650	Normal	A	650	650	650	650	650	650	650	650	—	—
	Low	500	-	A	500	500	500	500	500	500	500	500	—	—
024 FULL LOAD	High	950	+	A	950	950	950	950	950	950	950	950	—	—
	Med	825	Normal	A	825	825	825	825	825	825	825	825	—	—
	Low	725	-	A	725	725	725	725	725	725	725	725	—	—
036 PART LOAD	High	950	+	A	950	950	950	950	950	950	950	950	950	950
	Med	800	Normal	A	800	800	800	800	800	800	800	800	800	800
	Low	750	-	A	750	750	750	750	750	750	750	750	750	750
036 FULL LOAD	High	1300	+	A	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300
	Med	1100	Normal	A	1,100	1,100	1,100	1,100	1,100	1,100	1,100	1,100	1,100	1,100
	Low	950	-	A	950	950	950	950	950	950	950	950	950	950
048 PART LOAD	High	1400	+	A	1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400
	Med	1300	Normal	A	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300
	Low	1100	-	A	1,100	1,100	1,100	1,100	1,100	1,100	1,100	1,100	1,100	1,100
048 FULL LOAD	High	1800	+	A	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800
	Med	1600	Normal	A	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600
	Low	1400	-	A	1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400
060 PART LOAD	High	1800	+	A	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800
	Med	1600	Normal	A	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600
	Low	1400	-	A	1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400	1,400
060 FULL LOAD	High	2200	+	A	2,200	2,200	2,200	2,200	2,200	2,200	2,200	2,200	2,200	2,200
	Med	2000	Normal	A	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000
	Low	18000	-	A	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800
070 PART LOAD	High	2100	+	A	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100
	Med	1850	Normal	A	1,850	1,850	1,850	1,850	1,850	1,850	1,850	1,850	1,850	1,850
	Low	1600	-	A	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600
070 FULL LOAD	High	2500	+	A	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500
	Med	2350	Normal	A	2,350	2,350	2,350	2,350	2,350	2,350	2,350	2,350	2,350	2,350
	Low	2100	-	A	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100	2,100

LEGEND

— — Operation Not Recommended

Performance data (cont)

Carrier
United Technologies

50PTH,PTV SOUND DATA

UNIT SIZE		Load	Octave Band Sound Power Levels dB, re 10-12 Watts Center Frequency - Hz								A weighted overall (dBA)	A weighted overall (dBA)
			63	125	250	500	1000	2000	4000	8000	ARI-260:2011 (50 Hz-10 kHz)	ARI-260:2001 (100 Hz-10 kHz)
024	Casing Radiated	Cooling Part	79	66	60	54	53	44	38	31	59	58
		Cooling Full	80	63	60	54	54	47	40	37	59	58
		Heating Part	74	66	59	54	52	43	38	31	58	57
		Heating Full	74	65	61	53	54	45	39	34	58	58
		FAN Only	73	61	56	51	48	43	38	30	54	53
	Ducted Discharge	Cooling Part	75	67	60	67	63	59	56	49	68	63
		Cooling Full	76	68	62	68	65	61	58	52	70	67
		Heating Part	77	67	60	65	63	58	56	49	67	63
		Heating Full	77	70	62	68	65	61	59	53	70	67
		FAN Only	75	67	60	66	63	59	56	49	67	63
036	Casing Radiated	Cooling Part	75	61	53	50	45	39	34	31	53	52
		Cooling Full	75	65	55	52	49	43	41	40	56	55
		Heating Part	74	60	52	50	44	38	33	30	53	52
		Heating Full	73	66	57	51	48	42	39	36	56	55
		FAN Only	66	53	48	45	42	36	29	24	48	47
	Ducted Discharge	Cooling Part	78	65	56	61	59	55	53	46	64	63
		Cooling Full	89	71	59	63	62	59	57	51	68	67
		Heating Part	79	65	56	61	59	56	53	46	64	63
		Heating Full	80	68	59	63	62	59	58	52	67	67
		FAN Only	79	66	56	61	59	55	53	46	64	63
048	Casing Radiated	Cooling Part	75	69	56	52	50	43	36	32	57	57
		Cooling Full	77	75	60	53	53	48	40	36	62	61
		Heating Part	77	69	58	52	51	43	35	31	58	57
		Heating Full	76	75	69	53	53	47	39	34	63	63
		FAN Only	69	56	56	49	48	43	35	27	53	52
	Ducted Discharge	Cooling Part	82	70	59	63	63	59	58	52	67	67
		Cooling Full	88	75	64	67	66	64	62	58	72	71
		Heating Part	81	69	60	64	63	60	58	53	68	67
		Heating Full	83	74	64	67	66	64	63	58	71	71
		FAN Only	86	70	60	63	62	60	58	52	68	67
060	Casing Radiated	Cooling Part	82	66	58	55	51	45	42	37	59	57
		Cooling Full	79	72	62	58	55	49	47	42	62	61
		Heating Part	76	67	62	57	52	47	47	47	60	60
		Heating Full	82	74	63	58	56	49	46	42	63	62
		FAN Only	71	60	57	53	49	44	39	29	55	55
	Ducted Discharge	Cooling Part	89	73	63	67	63	61	60	54	70	69
		Cooling Full	94	79	68	70	68	66	66	61	75	74
		Heating Part	88	74	63	67	64	61	60	54	70	70
		Heating Full	94	79	68	70	68	66	66	61	75	74
		FAN Only	87	73	63	67	64	62	60	54	70	70
070	Casing Radiated	Cooling Part	82	68	61	57	52	49	44	36	61	59
		Cooling Full	80	72	63	59	54	51	46	39	62	61
		Heating Part	75	71	63	59	52	48	44	40	61	61
		Heating Full	77	74	64	60	55	50	45	37	63	63
		FAN Only	73	63	61	55	51	49	44	42	58	58
	Ducted Discharge	Cooling Part	92	78	67	69	68	66	64	59	74	73
		Cooling Full	97	83	72	72	73	70	69	64	78	77
		Heating Part	92	79	68	70	69	66	64	59	74	74
		Heating Full	96	82	73	73	74	70	69	64	79	78
		FAN Only	93	79	68	70	69	66	64	59	74	74

Electrical data

50PTH,PTV BLOWER MOTOR ELECTRICAL DATA

UNIT SIZE	COMPRESSOR	RATED VOLTAGE v-ph-Hz	VOLTAGE MIN/MAX	COMPRESSOR			TOTAL UNIT CONST TORQUE MOTOR (STANDARD)			TOTAL UNIT ECM CONST AIR FLOW MOTOR (OPTION)		
				QTY	RLA	LRA	FLA	MIN CIRCUIT AMPS	MAX FUSE/ HACR	FLA	MIN CIRCUIT AMPS	MAX FUSE/ HACR
50PT024	8733902168	208/230-1-60	197/253	1	11.7	58.3	2.8	17.4	25	2.8	17.4	25
	8733801381	265/277-1-60	—	1	9.1	54.0	2.6	14.0	20	2.6	14.0	20
	8733801385	208/230-3-60	197/253	1	6.5	55.4	2.8	10.9	15	2.8	10.9	15
	8733801392	460-3-60	—	1	3.5	28.0	2.1	6.4	15	2.6	6.9	15
50PT036	8733902169	208/230-1-60	197/253	1	15.3	83.0	6.0	25.1	35	6.8	25.9	35
	8733801382	265/277-1-60	—	1	13.0	72.0	4.9	21.2	30	5.5	21.8	35
	8733801386	208/230-3-60	197/253	1	11.6	73.0	6.0	20.5	30	6.8	21.3	30
	8733903844	460-3-60	-	1	5.7	38.0	3.2	10.4	15	5.5	12.6	15
50PT048	8733902170	208/230-1-60	197/253	1	21.2	104.0	6.0	32.4	50	6.8	33.2	50
	8733801387	208/230-3-60	197/253	1	14.0	83.1	6.0	23.5	35	6.8	24.3	35
	8733801393	460-3-60	-	1	6.4	41.0	3.2	11.3	15	5.5	13.5	15
50PT060	8733902171	208/230-1-60	197/253	1	27.1	152.9	7.6	41.5	60	9.1	43.0	70
	8733801388	208/230-3-60	197/253	1	16.5	110.0	7.6	28.3	40	9.1	29.8	45
	8733801394	460-3-60	-	1	7.2	52.0	4.0	13.1	20	6.9	16.0	20
50PT070	8733902172	208/230-1-60	197/253	1	29.7	179.2	7.6	44.7	70	9.1	46.2	70
	8733801389	208/230-3-60	197/253	1	17.6	136.0	7.6	29.6	45	9.1	31.1	45
	8733801395	460-3-60	-	1	8.5	66.1	4.0	14.6	20	6.9	17.5	25

LEGEND

FLA — Full Load Amps
HACR — Heating, Air Conditioning and Refrigeration
LRA — Locked Rotor Amps
MAX — Maximum
MIN — Minimum
RLA — Rated Load Amps

50PTH,PTV UNITS WITH EH OPTION - CONSTANT TORQUE MOTOR ELECTRICAL DATA

UNIT SIZE	EH RATED kW	STAGE	HEATER WATTS		HEATER AMPS		MOTOR FLA	CIRCUIT	MCA		MOP	
			240	208	240	208	(A)	FUSES	240	208	240	208
024	4.8	1	4,800	3,600	20.0	17.3	2.8	—	28.5	25.1	30	30
036	4.8	1	4,800	3,600	20.0	17.3	6.0	—	32.5	29.1	35	30
	9.6	1	9,600	7,200	40.0	34.6	6.0	—	57.5	50.8	60	60
048	4.8	1	4,800	3,600	20.0	17.3	6.0	—	32.5	29.1	35	30
	9.6	1	9,600	7,200	40.0	34.6	6.0	—	57.5	50.8	60	60
	14.4	2	14,400	10,800	60.0	51.9	6.0	F1/F2 F3/F4	82.5	72.4	90	80
060	4.8	1	4,800	3,600	20.0	17.3	7.6	—	34.5	31.1	35	35
	9.6	1	9,600	7,200	40.0	34.6	7.6	—	59.5	52.8	60	60
	14.4	2	14,400	10,800	60.0	51.9	7.6	F1/F2 F3/F4	84.5	74.4	90	80
	19.2	2	19,200	14,000	80.0	69.2	7.6	F1/F2 F3/F4	109.5	96.0	110	100
070	4.8	1	4,800	3,600	20.0	17.3	7.6	—	34.5	31.1	35	35
	9.6	1	9,600	7,200	40.0	34.6	7.6	—	52.8	52.8	60	60
	14.4	2	14,400	10,800	60.0	51.9	7.6	F1/F2 F3/F4	84.5	74.4	90	80
	19.2	2	19,200	14,000	80.0	69.2	7.6	F1/F2 F3/F4	109.5	96.0	110	100

LEGEND

EH — Electric Heat
FLA — Full Load Amps
MCA — Minimum Circuit Amps
MOP — Maximum Overcurrent Protection

Electrical data (cont)

50PTH,PTV UNITS WITH ELECTRIC HEAT OPTION - CONSTANT AIRFLOW ECM MOTOR ELECTRICAL DATA

UNIT SIZE	EH RATED kW	STAGE	HEATER WATTS		HEATER AMPS		MOTOR FLA (A)	CIRCUIT FUSES	MCA		MOP	
			240	208	240	208			240	208	240	208
024	4.8	1	4,800	3,600	20.0	17.3	2.8	—	28.5	25.1	30	30
036	4.8	1	4,800	3,600	20.0	17.3	6.8	—	33.5	30.1	35	35
	9.6	1	9,600	7,200	40.0	34.6	6.8	—	58.5	51.8	60	60
048	4.8	1	4,800	3,600	20.0	17.3	6.8	—	33.5	30.1	35	35
	9.6	1	9,600	7,200	40.0	34.6	6.8	—	58.5	51.8	60	60
	14.4	2	14,400	10,800	60.0	51.9	6.8	F1/F2	83.5	73.4	90	80
							6.8	F3/F4				
060	4.8	1	4,800	3,600	20.0	17.3	9.1	—	36.4	33.0	40	35
	9.6	1	9,600	7,200	40.0	34.6	9.1	—	61.4	54.6	70	60
	14.4	2	14,400	10,800	60.0	51.9	9.1	F1/F2	86.4	76.3	90	80
								F3/F4				
	19.2	2	19,200	14,000	80.0	69.2	9.1	F1/F2	111.4	97.9	125	100
								F3/F4				
070	4.8	1	4,800	3,600	20.0	17.3	9.1	—	36.4	33.0	40	35
	9.6	1	9,600	7,200	40.0	34.6	9.1	—	61.4	54.6	70	60
	14.4	2	14,400	10,800	60.0	51.9	9.1	F1/F2	86.4	76.3	90	80
								F3/F4				
	19.2	2	19,200	14,000	80.0	69.2	9.1	F1/F2	111.4	97.9	125	100
								F3/F4				

LEGEND

EH — Electric Heat
FLA — Full Load Amps
MCA — Minimum Circuit Amps
MOP — Maximum Overcurrent Protection

Application data

Aquazone™ water source heat pump products are available in a flexible, efficient array of models, which can be used in all types of water loop, ground water, and ground loop systems. Utilize Aquazone products to provide optimal energy efficient solutions and adapt to the most challenging design requirements.

AQUAZONE PRODUCT GUIDE

50 SERIES	TYPE SIZE (tons)	APPLICATION
50HQP,VQP	Large Capacity 6-20 (HQP) 6-30 (VQP)	Environmentally sound unit with Puron® refrigerant (R-410A) designed to handle large zoned areas for all geothermal and boiler/tower applications.
50PC	Compact $^1/_2$-6	Compact WSHP with Puron refrigerant (R-410A) for boiler/tower, ground water, or ground loop systems.
50PS	Premium Efficiency $^1/_2$-6	Premium, ultra efficient unit with Puron refrigerant (R-410A) for new boiler/tower, ground water, or ground loop systems.
50PEC	High Efficiency Console $^3/_4$-1$^1/_2$	Efficient console unit with Puron refrigerant (R-410A) and attractive design for finished interior, under-window installations.
50PT	Premium Efficiency 2-6	Premium, ultra efficient 2-stage unit with Puron refrigerant (R-410A) for new boiler/ tower, ground water, or ground loop systems.
50PSW	Water-to-Water 3-28	Efficient unit with Puron refrigerant (R-410A) serves as an alternative to pre-heat or cool air. Unit can be used as a stand-alone or supplemental boiler/chiller in most hydronic heating applications. Also conditions process fluids, lubricants, and refrigerants.

Water loop system

Water loop (or boiler/tower) system applications typically include a number of units plumbed to a common piping system. For optimal performance, this system should be designed between 2.25 and 3 gpm per ton of cooling capacity. The system is comprised of highly efficient packaged reverse cycle heat pump units interconnected by a water loop. The water circuit serves as both a sink and source for heat absorption and rejection and is designed for entering water temperatures between 60 F and 90 F. Within this temperature range units can heat or cool as required from the same water source. Transferring heat from warm to cold spaces in the building, whenever they coexist, conserves energy rather than creating new heat.

Refer to the **Carrier Water Source Heat Pump System Design Guide** for assistance with the design of water loop systems. The guide includes a practical approach for the latest and most current design recommendations including:

- product application, including horizontal, vertical, console, rooftop and water-to-water applications
- ventilation methods and system design, including energy recovery
- acoustical considerations for different product types
- addressing indoor air quality (IAQ) issues such as condensate removal and humidity control
- air distribution design including diffuser selection/ layout and ductwork design
- hydronic system design including pipe sizing/layout and boiler/tower sizing
- control configurations such as standalone, DDC (direct digital control), DCV (demand controlled ventilation), and VVT® (variable volume and temperature) controls
- Water Source Heat Pump Efficiency/Operational Cost Comparison chart
- system variations such as a system without a boiler, variable pumping, and variable air volume (VAV) for interior use

Ground water systems

To utilize Aquazone units in ground water applications, extended range should be specified. This will provide factory-installed insulation on the coaxial coil to prevent condensate from dripping when entering water temperatures are below 60 F. In addition, the copper coaxial coil installed on the Aquazone units may not be suitable for all water conditions. Refer to the Water Conditioning section for proper coaxial coil material selection.

Surface water system — This system is typically located near a lake or pond. In this application, the loop can be submerged in a series of coils beneath the water surface. The number of coils required depends on system load and design. This application requires minimum piping and excavation.

Open loop system — This system is used where ground water is plentiful. In this application, ground water is pumped through supply piping from the well to the building. The water is then pumped back into the ground through a discharge well as it leaves the building. An additional heat exchanger is usually installed between the building water piping system and the ground water piping system. This design limits the amount of piping and excavation required.

Aquazone units are provided with a standard TXV (thermostatic expansion valve) and are rated to extremely low temperatures to self-adjust the refrigeration circuit, therefore water regulating valves are not required on open loop systems. To conserve water on this type of system, a slow opening/closing solenoid valve is recommended.

Ground loop systems

There are many commonly specified designs for ground loop applications. Typical designs include vertical loops and horizontal loops. In some applications, water is piped from the ground or lake directly to the water source heat pump. Piping is limited to the amount of pipe required to get the water from the source to the unit.

NOTE: When utilizing Aquazone water source heat pumps in ground loop systems, refer to design considerations in the ground water system section.

Horizontal ground loop — This system is used when adequate space is available and trenching can be easily accomplished. A series of parallel pipes are laid out in trenches 3 to 6 ft below the ground surface, and then back-filled. Often, multiple pipes are used to maximize the heat transfer capability of each trench. The amount of pipe and the size of the ground loop field are based on ground conditions, heating, and cooling requirements of the application and system design.

Vertical ground loop — This system is used in vertical borehole applications. This design is well suited for retrofit applications when space is limited or where landscaping is already complete and minimum disruption of the site is desired. The vertical ground loop system contains a single

loop of pipe inserted into a hole. The hole is back-filled and grouted after the pipe is inserted. The completed loop is concealed below ground. The number of loops required depends on ground conditions, heating and cooling requirements, and the depth of each hole.

Hybrid systems — In some applications, it may be beneficial to incorporate a cooling tower into the ground loop system to reduce the overall cost. A hybrid system discards excess heat into the air and increases the cooling performance of the ground loop.

Condensate drainage

Venting — Condensate lines should be properly vented to prevent fan pressure from causing water to hang up in the piping. Condensate lines should be pitched to assure full drainage of condensate under all load conditions. Chemical treatment should be provided to remove algae in the condensate pans and drains in geographical areas that are conducive to algae growth.

Trapping — Condensate trapping is essential on every water source heat pump unit. A trap is provided to prevent the backflow of moisture from the condensate pan and into the fan intake or downstream into the mechanical system. The water seal or the length of the trap depends on the positive or negative pressure on the drain pan. As a rule of thumb, the water seal should be sized for 1 in. for every 1 in. of negative pressure on the unit. The water seal is the distance from the bottom of the unit condensate piping connection to the bottom of the condensate drain line run-out piping. Therefore, the trap size should be double the water seal dimension.

Horizontal units — Horizontal units should be sloped toward the drain at a $^1/_4$ in. per foot pitch. If it is not possible to meet the pitch requirement, a condensate pump should be designed and installed at the unit to pump condensate to a building drain. Horizontal units are not internally trapped; therefore an external trap is necessary. Each unit must be installed with its own individual trap and means to flush or blow out the condensate drain. The design of a common trap or vent for multiple units is not acceptable. The condensate piping system should not be designed with a pipe size smaller than the drain connection pipe size.

Vertical units — Vertical units utilize a condensate hose inside the cabinet that acts as a trapping loop, therefore an external trap is not necessary. Each unit must be installed with its own vent and means to flush or blow out the condensate drain lines. Do not install a common trap or vent on vertical units.

Water conditioning

In some applications, maintaining proper water quality may require the use of higher corrosion protection for the water-to-refrigerant heat exchanger. Water quality varies from location to location and is unique for each job. Water characteristics such as pH value, alkalinity, hardness, and specific conductance are of importance when considering any WSHP application. Water typically includes impurities and hardness that must be removed. The required treatment will depend on the water quality as well as type of system. Water problems fall into three main categories:

1. Scale formation caused by hard water reduces the heat transfer rate and increases the water pressure drop through the heat exchanger. As water is heated, minerals and salts are precipitated from a solution and deposited on the inside surface of the pipe or tube.
2. Corrosion is caused by absorption of gases from the air coupled with water on exposed metal. Corrosion is also common in salt-water areas.
3. Organic growths such as algae can reduce the heat transfer rate by forming an insulating coating on the inside tube surface. Algae can also promote corrosion by pitting.

NOTE: In most commercial water loop applications, Aquazone WSHP units use copper water-to-refrigerant heat exchanger. Units can also be equipped with a cupronickel heat exchanger for applications where water is outside the standard contaminant limits for a copper heat exchanger.

WATER QUALITY GUIDELINES

CONDITION	HX MATERIAL*	CLOSED RECIRCULATING†	OPEN LOOP AND RECIRCULATING WELL**		
Scaling Potential — Primary Measurement					
Above the given limits, scaling is likely to occur. Scaling indexes should be calculated using the limits below.					
pH/Calcium Hardness Method	All	N/A	**pH < 7.5 and Ca Hardness, <100 ppm**		
Index Limits for Probable Scaling Situations (Operation outside these limits is not recommended.)					
Scaling indexes should be calculated at 150 F for direct use and at 90 F for indirect HX use. A monitoring plan should be implemented.					
Ryznar Stability Index	All	N/A	**6.0 - 7.5** If >7.5 minimize steel pipe use.		
Langelier Saturation Index	All	N/A	**–0.5 to +0.5** If <–0.5 minimize steel pipe use. Based upon 150 F direct well, 85 F indirect well HX.		
Iron Fouling					
Iron Fe^{2+} (Ferrous) (Bacterial Iron Potential)	All	N/A	**<0.2 ppm (Ferrous)** If Fe^{2+} (ferrous) >0.2 ppm with pH 6 - 8, O_2<5 ppm check for iron bacteria.		
Iron Fouling	All	N/A	**<0.5 ppm of Oxygen** Above this level deposition will occur.		
Corrosion Prevention††					
pH	All	6 - 8.5 Monitor/treat as needed.	**6 - 8.5** Minimize steel pipe below 7 and no open tanks with pH <8.		
Hydrogen Sulfide (H_2S)	All	N/A	**<0.5 ppm** At H_2S>0.2 ppm, avoid use of copper and cupronickel piping or HXs. Rotten egg smell appears at 0.5 ppm level. Copper alloy (bronze or brass) cast components are okay to <0.5 ppm.		
Ammonia Ion as Hydroxide, Chloride, Nitrate and Sulfate Compounds	All	N/A	**<0.5 ppm**		
Maximum Chloride Levels			Maximum allowable at maximum water temperature.		
			50 F (10 C)	75 F (24 C)	100 F (38 C)
	Copper	N/A	<20 ppm	NR	NR
	Cupronickel	N/A	<150 ppm	NR	NR
	304 SS	N/A	<400 ppm	<250 ppm	<150 ppm
	316 SS	N/A	<1000 ppm	<550 ppm	<375 ppm
	Titanium	N/A	>1000 ppm	>550 ppm	>375 ppm
Erosion and Clogging					
Particulate Size and Erosion	All	<10 ppm of particles and a maximum velocity of 6 fps. Filtered for maximum 800 micron size.	<10 ppm (<1 ppm “sandfree” for reinjection) of particles and a maximum velocity of 6 fps. Filtered for maximum 800 micron size. Any particulate that is not removed can potentially clog components.		
Brackish	All	N/A	Use cupronickel heat exchanger when concentrations of calcium or sodium chloride are greater than 125 ppm are present. (Seawater is approximately 25,000 ppm.)		

LEGEND

HX — Heat Exchanger
N/A — Design Limits Not Applicable Considering Recirculating Potable Water
NR — Application Not Recommended
SS — Stainless Steel

*Heat exchanger materials considered are copper, cupronickel, 304 SS (stainless steel), 316 SS, titanium.

†Closed recirculating system is identified by a closed pressurized piping system.

**Recirculating open wells should observe the open recirculating design considerations.

††If the concentration of these corrosives exceeds the maximum allowable level, then the potential for serious corrosion problems exists.

Sulfides in the water quickly oxidize when exposed to air, requiring that no agitation occur as the sample is taken. Unless tested immediately at the site, the sample will require stabilization with a few drops of one Molar zinc acetate solution, allowing accurate sulfide determination up to 24 hours after sampling. A low pH and high alkalinity cause system problems, even when both values are within ranges shown. The term pH refers to the acidity, basicity, or neutrality of the water supply. Below 7.0, the water is considered to be acidic. Above 7.0, water is considered to be basic. Neutral water registers a pH of 7.0.

To convert ppm to grains per gallon, divide by 17. Hardness in mg/l is equivalent to ppm.

Application data (cont)

Acoustical design

Sound power levels represent the sound as it is produced by the source, the WSHP unit, with no regard to attenuation between the source and the space. Acoustical design goals are necessary to provide criteria for occupied spaces where people can be comfortable and communicate effectively over the background noise of the air-conditioning system and other background noise sources.

Acoustical design goals are desirable sound pressure levels within a given conditioned space and are represented by noise criteria (NC) curves. Noise criteria curve levels represent a peak over a full spectrum of frequencies. A high value in a low frequency band has the same effect on NC level as a lower value in a high frequency band. It is important that sound levels be balanced over the entire spectrum relative to the NC curve. The lower the NC criteria curve, the more stringent the room acoustical design must be to meet the design goals.

It is important to know how to convert NC levels from the unit ratings in terms of sound power (Lw). This conversion depends on the specifics of the acoustical environment of the installation.

The resulting calculations are compared to the NC curve selected for the area to assess the acoustical design.

Some of the factors that affect conversion of sound power to sound pressure and consequent NC level include:

- type of acoustical ceiling
- use of metal or flex duct
- absorption in the occupied space
- location in the occupied space
- open or closed layout plan
- use of open or ducted returns
- orientation of unit to occupant
- use of lined or unlined duct

WSHP sound control

The analysis of the projected sound level in the conditioned space caused by a WSHP unit located in a ceiling plenum is quite involved. The key is to have good sound power ratings (Lw) in dB on the equipment to determine the sound attenuation effect of the ductwork, ceiling and room. In combination with utilizing standard Aquazone™ equipment attenuating features or the advanced mute package features, suggestions for horizontal and vertical unit sound design are provided to design around the WSHP units.

Horizontal units

Use the following guidelines for layout of Aquazone horizontal units to minimize noise:

1. Obtain sound power ratings in accordance with latest standards from manufacturers to select quietest equipment.
2. Do not locate units over a space with a required NC of 40 or less. Instead, locate units above less sensitive noise areas such as above or in equipment rooms, utility closets, restrooms, storage rooms, or above corridors.
3. Provide at least 10 feet between WSHP units to avoid the additive effect of two noise sources.
4. Provide an acoustical pad underneath the WSHP unit in applications where the unit must be mounted above noise sensitive areas such as private offices or conference rooms. The pad attenuates radiated noise. Be sure the pad has an area at least twice that of the WSHP footprint.
5. Maximize the installed height above the suspended ceiling.
6. Be sure the WSHP unit is located at least 6 feet away from any ceiling return grille to prevent line-of-sight casing noise from reaching the space below.
7. Suspend the WSHP unit from the ceiling with hangers that utilize spring or neoprene type isolators to reduce vibration transmission.
8. Utilize flexible electrical connections to the WSHP unit. DO NOT USE NOT RIGID CONNECTIONS.
9. Utilize flexible loop water and condensate piping connections to the WSHP unit.
10. Use a canvas duct connector to connect the WSHP discharge to the downstream duct system. This reduces vibration-induced noise.
11. Provide acoustic interior lining for the first 20 feet of discharge duct, or until the first elbow is reached. The elbow prevents line-of-site sound transmission in the discharge duct.
12. Provide turning vanes in ductwork elbows and tees to reduce air turbulence.
13. Size the sheet metal supply duct with velocities no greater than 1000 fpm.
14. Ensure ductwork is rigid.
15. Use round duct whenever possible to further reduce noise.
16. Allow at least 3 equivalent duct diameters of straight duct upstream and downstream of the unit before allowing any fittings, transitions, etc.
17. Seal all penetrations around duct entering the space.
18. Provide a 4-ft run-out duct made of flexible material to connect a diffuser to the supply trunk duct. The flex duct provides an "attenuating end-effect" and reduces duct-transmitted sound before it reaches the space. Typically a 6 dB sound reduction can be accomplished with the use of flex duct.
19. Locate the run-out duct balancing damper as far away from the outlet diffuser as possible. Locating the balancing damper at the trunk duct exit is the best location.
20. If return air is drawn through a ceiling plenum, provide an acoustically lined return duct elbow or "L" shaped boot at the WSHP to eliminate line-of-sight noise into the ceiling cavity and possibly through ceiling return air grilles. Face the elbow or boot away from the nearest adjacent WSHP unit to prevent additive noise.
21. Do not hang suspended ceiling from the ductwork.

Vertical units

All guidelines established for horizontal units also apply for vertical units. In addition, since vertical units tend to be installed in small equipment rooms or closets, the following guidelines apply:

1. Mount the unit on a pad made of high-density sound absorbing material such as rubber or cork. Extend the pad beyond the WSHP unit footprint by at least 6 inches in each direction.
2. Since the unit returns airflow through a grille mounted in a closet door, provide a sound barrier or some other modification of the closet to prevent line-of-sight noise into the space.
3. Follow good duct design practice in sizing and locating the connection of the WSHP discharge to the supply duct system. Use an elbow with turning vanes and bent in the direction of the fan rotation to minimize turbulence. Make any duct transitions as smooth and as gradual as possible to minimize turbulence and loss of fan static pressure.

Solenoid valves

In applications using variable flow pumping, solenoid valves can be field-installed and operated from the control board in the Aquazone™ WSHP unit.

Freeze protection

Applications where systems are exposed to outdoor temperatures below freezing (32 F) must be protected from freezing. The most common method of protecting water systems from freezing is adding glycol concentrations into the water. Design care should be used when selecting both the type and concentrations of glycol utilized due to the following:

- Equipment and performance may suffer with high concentrations of glycol and other antifreeze solutions.
- Loss of piping pressure may increase greatly, resulting in higher pumping costs.
- Higher viscosity of the mixture may cause excess corrosion and wear on the entire system.
- Acidity of the water may be greatly increased, promoting corrosion.
- Glycol promotes galvanic corrosion in systems of dissimilar metals. The result is corrosion of one metal by the other, causing leaks.

Hot gas reheat

Hot gas reheat (HGR) allows the user to not only control space temperature, but also humidity levels within the conditioned space. Excessive moisture in the space can promote mold growth leading to damage in the structure or interior surfaces, as well as reducing the air quality and creating an unhealthy environment.

Possible causes of excess humidity could be a byproduct of the unit having to operate under a widely varying load, an oversized short cycling unit, a high percentage of unconditioned outside air being introduced into the space, a high latent load in the space or any location where humidity infiltration is a problem.

Typical unit control is by a wall mounted thermostat that senses temperature in the occupied space. By utilizing a humidistat in addition to the thermostat, part load units with hot gas reheat are able to control the humidity levels in the space as well. The hot gas reheat option allows cooling and dehumidification to satisfy both the thermostat and humidistat while preventing over-cooling of the space while in the dehumidification mode.

Once the thermostat reaches set point temperature, and is above humidity set point, the unit controller will energize the reheat valve operating the unit in hot gas reheat mode, first cooling and dehumidifying, then reheating the air (using hot refrigerant gas) before delivering it to the space, usually 2° to 5° F below room temperature. The unit operates like a dehumidifier by reheating the air along a constant sensible heat line, while the relative humidity of the leaving air is reduced. This option offers significant energy savings over reheating air with electric heating coils.

The moisture removal capacity of a specific heat pump is determined by the unit latent capacity rating. A heat pump's latent capacity can be determined by reviewing the heat pump specification data sheets. Depending upon the entering water and air conditions, a total and sensible capacity can be interpolated from the data sheets. Subtracting sensible capacity from total capacity yields latent capacity. Dividing the latent capacity by 1069 converts the amount of moisture removal from Btuh to lb/hr.

A hot gas reheat valve and a reheat coil are included in the refrigerant circuit. The refrigerant circuits in the cooling and heating modes are identical to a standard heat pump. In the reheat mode, the compressor discharge gas is diverted through the reheat valve to the reheat coil which is located downstream of the cooling coil. The superheated refrigerant gas reheats the air leaving the cooling coil. The hot refrigerant gas then passes though the water to refrigerant coil where it is condensed to a liquid. From this point the rest of the cooling cycle is completed as in a regular heat pump. There are check valves to prevent refrigerant flow into the reheat coil during standard cooling/heating cycles.

Guide specifications

Two-Stage Water Source Heat Pumps with Puron® Refrigerant (R-410A)

HVAC Guide Specifications

Size Range: **18,500 to 78,700 Btuh Cooling Capacity**
14,400 to 84,000 Btuh Heating Capacity

Carrier Model Number: **50PTH, 50PTV**

Part 1 — General

1.01 SYSTEM DESCRIPTION

A. Single-package horizontally and vertically mounted water source heat pump with Puron refrigerant (R-410A) and electronic controls.

B. Equipment shall be completely assembled, piped and internally wired. Capacities and characteristics as listed in the schedule and the guide specifications that follow.

1.02 QUALITY ASSURANCE

A. All equipment listed in this section must be rated and certified in accordance with ARI/ISO, latest edition, and ETL listed to UL standard 1995. The units shall have ARI/ISO and ETL labels.

B. All units shall be factory tested in all operating modes and safety switch operation shall be verified. Quality control system shall automatically perform via computer: triple leak check, pressure tests, evacuate and accurately charge system, perform detailed heating and cooling mode tests, and quality cross check all operational and test conditions to pass/fail data base.

NOTE: If unit fails on any cross check, system shall not allow unit to ship.

C. Serial numbers will be recorded by factory and furnished to contractor on report card for ease of unit warranty status. Units shall be prewired and precharged in factory.

Part 2 — Product

2.01 EQUIPMENT

A. General:

→ Units shall be supplied completely factory built for an entering water temperature range from 25 to 110 F as standard. Equivalent units from other manufacturers can be proposed provided approval to bid is given 10 days prior to bid closing.

B. Basic Construction

1. Units shall have the air flow arrangement as shown on the plans. If units with these arrangements are not used, the contractor supplying the water source heat pumps is responsible for any extra costs incurred by other trades and must submit detailed mechanical drawings showing ductwork requirements and changes or relocation of any other mechanical or electrical system. If other arrangements make servicing difficult the contractor must provide access panels and clear routes to ease service. The architect must approve all changes 10 days prior to bid.
2. All units shall have stainless steel drain pans to comply with this project's IAQ (indoor air quality) requirements. No exceptions shall be allowed.
3. All water source heat pumps shall be fabricated from sheet metal finished with G90 galvanized steel. All interior surfaces shall be lined with $^1/_2$ in. thick, multi-density acoustic insulation. All insulation must meet NFPA 90A and be certified to meet the GREENGUARD Indoor Air Quality Standard for Low Emitting Products. One blower access panel and two compressor compartment access panels shall be removable with supply and return air ductwork in place.
4. Unit shall have a floating base pan consisting of a $^1/_2$ in. (12 mm) thick high density rubber pad between the compressor base plate and the unit base pan to prevent transmission of vibration to the structure.
5. All units shall have a factory installed four sided filter rack capable of accepting either one or two inch filters. Units shall have a 1-in. thick throwaway type glass fiber filter as standard. The filter rack shall incorporate a 1-in. duct flange. The contractor shall purchase one spare set of filters and replace factory-shipped filters upon completion of start-up.
6. Cabinets shall have separate holes and knockouts for entrance of line voltage and low voltage control wiring. Supply and return water connections shall be brass FPT fittings and shall be securely mounted flush to the cabinet allowing for connection to a flexible hose without the use of a back-up wrench. Water connections which protrude through the cabinet shall not be allowed.
7. Hanging brackets shall be provided as standard for horizontal units.
8. All units shall have condensate overflow switch, Air-Coil and Water-Coil Freeze sensor as standard.

C. Access Panels:

All units (horizontal and vertical) must have a minimum of three access panels for serviceability of compressor compartment. Units having only one access panel to compressor, heat exchangers, expansion device, or refrigerant piping shall not be acceptable.

D. Insulation:

Standard cabinet panel insulation must meet NFPA 90A requirements, air erosion and mold growth limits of UL-181, stringent fungal resistance test per ASTM C1071 and ASTM G21, and shall meet zero level bacteria growth per ASTM G22. Unit insulation must meet these stringent requirements or unit(s) will not be accepted.

E. Factory-Installed Wiring:

All factory-installed wiring passing through factory knockouts and openings shall be protected from sheet metal edges at openings by plastic ferrules.

F. Unit Removal:

Contractor must ensure that units can be easily removed for servicing and coordinate locations of electrical conduit and lights with the electrical contractor.

G. Compressor:

1. Compressor section interior surfaces shall be lined with $1/2$ in. thick, dual density, $1\,3/4$ lb per cu. ft acoustic type fiberglass insulation. Air-handling section interior surfaces shall be lined with $1/2$ in. thick, single density, $1\,3/4$ lb per cu. ft foil-backed fiber insulation for ease of cleaning.
2. Insulation placement shall be designed in a manner that will eliminate any exposed edges to prevent the introduction of glass fibers into the airstream. Units without foil-backed insulation in the air-handling section will not be accepted.
3. The compressor shall have a dual level vibration isolation system.
4. The compressor will be mounted on computer-selected vibration isolation springs to a large heavy gage compressor mounting tray plate, which is then isolated from the cabinet base with rubber grommets for maximized vibration attenuation.
5. Compressor shall be located in an insulated compartment away from airstream to minimize sound transmission.
6. Compressor shall have thermal overload protection.
7. The heat pumps shall be fabricated from heavy gage G90 galvanized steel with powder coat paint finish. Both sides of the steel shall be painted for added protection.
8. All units must have an insulated panel separating the fan compartment from the compressor compartment.
9. Units with the compressor in the airstream are not acceptable.

H. Fan and Motor Assembly:

1. Blower shall have inlet rings to allow removal of wheel and motor from one side without removing housing.
2. Units shall have a direct-drive centrifugal fan. The fan motor shall be a factory preprogrammed high efficiency constant torque type.
3. The fan motor shall be isolated from the housing by rubber grommets.
4. The fan and motor assembly must be capable of overcoming the external static pressures as shown on the schedule. External static pressure rating of the unit shall be based on a wet coil. Ratings based on a dry coil shall NOT be acceptable.
5. All units shall have removable blower inlet ring as standard for ease of service and maintenance.

I. Refrigerant Circuit:

1. Units shall use R-410A refrigerant. All units shall have a factory sealed and fully charged refrigerant circuit with the following components:
2. Two stage hermetic compressor specifically designed for heat pump operation and shall be internally protected with thermal overload protection and mounted on rubber vibration isolators.
3. Bi-directional refrigerant metering thermal expansion valves. Finned tube refrigerant to air heat exchanger not exceeding 14 fins per inch. Refrigerant to air heat exchangers shall utilize enhanced aluminum fins and rifled copper tube construction rated to withstand 600 psig refrigerant working pressure. All air coils shall have non-ferrous aluminum end plates.
4. Reversing valve. Reversing valves shall be four way solenoid activated refrigerant valves which shall fail to the heating operation should the solenoid fail to function. Reversing valves which fail to the cooling operation shall not be allowed.
5. Coaxial (tube in tube) refrigerant to water heat exchanger. Refrigerant to water heat exchangers shall be insulated and with copper inner water tube and steel outer refrigerant tube design rated to withstand 600 psig working refrigerant pressure and 400 psig working water pressure. Shell and tube style refrigerant to water heat exchangers shall be treated as pressure vessels and shall require refrigerant pressure relief valves piped to the exterior of the building. The contractor supplying the water source heat pumps with shell and tube heat exchangers shall be responsible for any additional installation costs. Brazed plate water to refrigerant heat exchangers shall require additional centrifugal separators added to the supply water piping at each unit. Each separator shall have an automated clean out valve piped to a waste line. The contractor supplying water source heat pumps with brazed plate heat exchangers shall be responsible for any additional costs.
6. Safety controls including both a high pressure and low pressure switch. Temperature sensors shall not replace these safety switches.
7. Access fittings shall be factory installed on high and low pressure refrigerant lines to facilitate field service.

8. Activation of any safety device shall prevent compressor operation via a lockout circuit. The lockout circuit shall be reset at the thermostat or at the contractor supplied disconnect switch. Units which may be reset at the disconnect switch only shall not be acceptable.

J. Thermostatic Expansion Valve:
   1. Expansion valves shall be dual port balanced types with external equalizer for optimum refrigerant metering.
   2. Units shall be designed and tested for operating ranges of entering water temperatures from 25 to 110 F.
   3. Reversing valve shall be four-way solenoid activated refrigerant valve, which shall default to heating mode should the solenoid fail to function. If the reversing valve solenoid defaults to cooling mode, an additional low temperature thermostat must be provided to prevent overcooling an already cold room.

K. Controls and Safeties:
   1. Electrical:

      A control box shall be located within the unit and shall contain a transformer, controls for the compressor, reversing valve and fan motor operation and shall have a terminal block for low voltage field wiring connections. The transformer shall be rated for a minimum 75 va. All units shall be nameplated for use with time delay fuses or HACR (Heating, Air-Conditioning, and Refrigeration) circuit breakers. Unit controls shall be 24 volts.
   2. Solid-State Safety Circuit

      All units shall have a solid-state UPM (unit protection module) safety control circuit with the following features:
      a. Anti-short cycle time delay on compressor operation.
      b. Random start on power up mode.
      c. Brown out/surge/power interruption protection.
      d. Low pressure switch 120 second bypass timer.
      e. Shutdown on the following fault indications:
         1) High or low refrigerant pressure safety switches inputs.
         2) Freeze sensors shall monitor refrigerant temperature to the water coil in the heating mode and refrigerant coil in the cooling mode.
         3) Condensate sensor input.
      f. Alarm output which closes for selectable dry contact closure or 24 vac remote fault indication.
      g. Alarm output selectable for constant output for general alarm notification, or pulse output for annunciation of the specific fault alarm.
      h. Selectable reset of unit at thermostat or disconnect.
      i. Automatic intelligent reset. Unit shall automatically reset after a safety shut down and restart after the anti-short cycle timer and random start timer expire. Should a fault reoccur within 60 minutes after reset, then a permanent lockout will occur. Reset attempts shall be selectable for either 2 or 4 tries. A condensate overflow will place the unit in an immediate hard lockout.
      j. Ability to defeat time delays for servicing.
      k. A light emitting diode (LED) to indicate safety alarms. The LED shall annunciate the following alarms:
         1) High refrigerant pressure,
         2) Low refrigerant pressure,
         3) Low refrigerant temperature to the water coil in the heating operation,
         4) High level of condensate in the drain pan,
         5) Brown out/surge/ power interruption.
      l. The LED will display each fault condition as soon as the fault occurs. If a permanent lockout occurs, then the fault LED will display the type of fault until the unit is reset.
      m. UL listed, CUL listed, and RFI, ESD, and transient protected.
   3. Deluxe D Controls:

      Optional electronic Deluxe D control shall have all the features of the Complete C control with the following additional features:
      a. 75 va transformer.
      b. Single grounded wire to initiate night setback, or emergency shutdown.
      c. Boilerless system control can switch automatically to electric heat at low loop water temperature.
      d. Selection of boilerless changeover temperature set point.

      Units not having automatic low sensible heat ratio cooling will not be accepted; as an alternate, a hot gas reheat coil may be provided with control system for automatic activation.

L. Piping:
   1. Supply and return water connections shall be copper FPT fittings and shall be securely mounted flush to the cabinet corner post allowing for connection to a flexible hose without the use of a back-up wrench.
   2. All water connections and electrical knockouts must be in the compressor compartment corner post so as to not interfere with the serviceability of unit. Contractor shall be responsible for any extra costs involved in the installation of units that do not have this feature.

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